OFFICIAL REGISTER OF HARVARD UNIVERSITY 1983-84

HARVARD SCHOOL OF PUBLIC HEALTH

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A Note from the Dean

The School has three primary missions: first, the education of scholars who seek to understand and control the health problems of society; second, the research that addresses those problems; and third, the training of professionals who deal with them. The scope of the teaching and research programs extends all the way from the development of concepts and methods through studies of natural phenomena and of policy development, to the ultimate steps of implementation and evaluation. The School's programs lie in two major areas. The first is disease prevention and involves the biological, chemical, physical and social factors that affect the health of society. The second is the organization and function of systems involved in the delivery of health services.

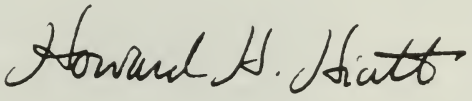
Public health is not itself a discipline, but its practitioners require expertise in one or more of a group of disciplines. The increasing complexity of public health questions requires the skills of numeric, natural, behavioral, social, and managerial scientists. The academic programs of the School must impart a sound background in a basic discipline as well as an active and credible experience in the application of the discipline to health problems. Those programs must also demonstrate how people from different disciplines can cooperate in approaches to health problems.

We are a professional school. Strong training programs are required for new health professionals and for those in mid-career status. Health care systems in this country and abroad require professionals well-equipped to plan and manage the use of resources. With recent and prospective changes in health policy in the United States and elsewhere, our professional graduates must be equipped to anticipate, encourage and deal with change, and to be among its leaders. In our complicated society, critical problems in areas such as occupational health, nutrition, population, and pollution of the air, the soil and the water all share certain characteristics. A better data base of solid scientific information is essential, but inadequate by itself, to equip professionals to identify and implement socially appropriate and effective policy. Resources are scarce, and costs and benefits must be calculated. Some organizations must often be influenced to change their behavior and large groups of people mobilized to implement new policies. And this must be done in a context in which available data are incomplete and inferences difficult.

The School's professional programs, therefore, must be based on both natural and social sciences and must depend heavily on quantitative analytic methods. The programs must emphasize a symbiotic relationship between our historically strong areas and a potentially unique set of analytic and managerial skills applied to health — all of which are needed to improve public health in the current context. This is true not only for degree programs designed to train new health professionals, but also for our efforts to rapidly assist today's public health professionals by making available strong mid-career educational opportunities.

The School has traditionally sponsored programs directed at the health problems of the developing world. Disease, malnutrition, population excess relative to resources, and the closely linked problems of inadequate educational opportunities and economic under-development are of great professional concern to much of our faculty and student body. That the School should be concerned with these critical problems is generally agreed. The question of appropriate roles for the School in this area is now receiving much attention from faculty and students, and will surely be guided by the judgment and advice of colleagues from developing countries. As health programs in those countries evolve, continuing change in our programs can (and should) be anticipated.

The boundaries of public health are ever widening, and this School has assumed a leadership role in promoting that process. It is continuing its commitment to traditional public health approaches and integrating them with approaches more recently identified as important. Our students must gain an appreciation of, and participate in, the major contributions to health made by a growing range of disciplines.



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Every effort is made to insure the information contained in this *Register* is accurate at the time of publication. However, the School of Public Health reserves the right to make changes without notice in tuition and fees, admission and degree requirements, courses of instruction, and any other information contained herein.

As a matter of policy, Harvard University does not discriminate among applicants and students in admissions, educational policies, scholarship and loan programs, and athletic and other programs on the basis of race, religion, sex, national origin, color, creed, handicap, age, sexual orientation, marital or parental status, or status as a Vietnam era or disabled veteran.

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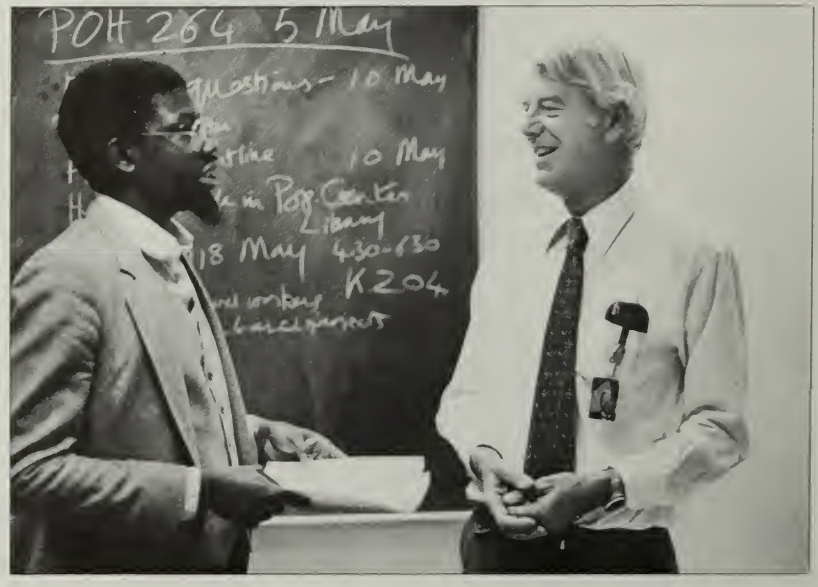
Above, Dr. John Little, third from left, Director of the Kresge Center for Environmental Health with David Yandell, Yoshio Kano, and Andy Grosousky. Below, Dr. John Wyon, right, Senior Lecturer on Population Studies, with Osahon Ukponmwan, student in the General MPH Program.



ACADEMIC CALENDAR 1983-84

September 12, Monday
Orientation and registration for new international students: 9:30 A.M., International House, 203 Park Drive.
September 13, Tuesday
Registration for new U.S. students: G-Level, Kresge Building, 10:30 A.M. - 2:00 P.M., according to first letter of last name:
A - F 10:30 A.M.
G - L 11:30 A.M.
M - S 12:30 P.M
T - Z 1:30 P.M.
Opening Session for all new students:
2:00-4:00 P.M., G-1 auditorium, Kresge Building.
All new students are required to attend the opening session and to be present for the registration period.
September 14, Wednesday
Registration for all returning students:
G-Level, Kresge Building, 9:00 A.M.-1:00 P.M. according to first letter of last name:
A - E 9:00 A.M.
F - K 10:00 A.M.
L - R 11:00 A.M.
S - Z 12:00 Noon
Students who fail to register on the appointed dates will have a $25 late fee assessed on their fall term bills. The period between the opening sessions and September 19 will be devoted to orientation lectures, individual conferences with faculty members, and selection of courses of study.
September 19, Monday
First period "a" and "ab" courses begin.
September 28, Wednesday
Study cards for all returning students due by 3:00 P.M. in the Registrar's Office. Students who file late study cards will be charged a $25 per week late fee. Once a study card is filed, all changes must be made on drop/add petitions. A fee is charged for each petition submitted. Students are allowed one free petition during the "b" and "d" periods.
October 3, Monday
Study cards for all new students due by 3:00 P.M. in the Registrar's Office. Students who file late study cards will be charged a $25 per week late fee. Once a study card is filed, all changes must be made on drop/add petitions. A fee is charged for each petition submitted. Students

October 3, Monday *continued*
are allowed one free petition during the "b" and "d" periods.
Last day to register for the fall term at HSPH.
Last day to cross-register for fall term "a" and "ab" period courses.
Last day to cancel registration with refund of term bill payment.
October 10, Monday
Columbus Day, a holiday.
October 11, Tuesday
Last day to drop/add and change grading option for "a" and "ab" period courses by 3:00 P.M.
November 9, Wednesday
Bound, signed theses due in the Registrar's Office by 3:00 P.M. for doctoral students applying for November degrees.
November 10, Thursday
First period ends.
November 11, Friday
Veterans' Day, a holiday.
November 14, Monday
Second period "b" courses begin.
Students are allowed one drop/add petition for "b" and "bc" courses without charge until 3:00 P.M. on November 28.
November 23, Wednesday
Thanksgiving recess begins at 5:30 P.M.
November 28, Monday
Thanksgiving recess ends at 8:00 A.M.
Deadline for filing degree applications for degree in March 1984.
Deadline for applications for Nonresident doctoral status for spring term.
Last day to drop/add and change grading options for "b" and "bc" period courses by 3:00 P.M.
Last day to cross-register for "b" and "bc" courses by 3:00 P.M.
December 16, Friday
Winter recess begins at 5:30 P.M.
January 3, Tuesday
Winter recess ends at 8:00 A.M.
January 9, Monday
Spring study card materials available in the Registrar's Office for continuing students.
Note: Students registered through the year will not be allowed to file study cards for the spring term until all financial obligations to the University have been met. Last day to add "e" period courses.

January 20, Friday
Second period courses end.
Preliminary spring term study cards for all students due by 3:00 P.M. in the Registrar's Office. Students who file late study cards will be charged a $25.00 per week late fee.
Deadline for completing previous spring term courses graded as INCOMPLETE.
Semester break recess begins at 5:30 P.M.
January 23 through January 27
Supervised special studies or field observations: "e" period.
January 30, Monday
Semester break recess ends at 8:00 A.M.

Spring Term

January 30, Monday
Third period "c" and "cd" courses begin.
Registration for students not enrolled during the fall semester. Students should come in person to the Registrar's Office between 10:00 A.M. and 3:00 P.M.
February 8, Wednesday
Last day to cross-register for the spring term or to cancel registration with refund of spring term payment.
February 10, Friday
Final spring term study and course cards due by 3:00 P.M. in the Registrar's Office. Students who file late study cards will be charged a $25.00 per week late fee. After this final study card is filed all changes must be submitted for approval to the Committee on Admissions and Degrees. A $25.00 fee is charged for each petition.
February 15, Wednesday
Bound, signed theses due by 3:00 P.M. in the Registrar's Office for doctoral students applying for March degrees.
February 20, Monday
Washington's Birthday, a holiday.
March 23, Friday
Third period ends.
Spring recess begins at 5:30 P.M.
April 2, Monday
Spring recess ends at 8:00 A.M.
Fourth period "d" courses begin.
Students allowed one drop/add petition for "d" courses without charge until 3:00 P.M. on April 9.
Deadline for filing degree applications for degrees in June.
April 9, Monday
Last day to drop/add and change grading options for "d" courses by 3:00 P.M.
Last day to cross-register for "d" courses by 3:00 P.M.
April 30, Monday
Last day to file petition for Nonresident doctoral status for the academic year 1984-85.
May 25, Friday
Fourth period ends.
Deadline for registration and tutorial forms for HSPH summer tutorials. Deadline for completing fall term courses graded as INCOMPLETE.
May 28, Monday
Memorial Day, a holiday.
May 29 through June 6
Post class period.
May 30, Wednesday
Bound, signed theses due by 3:00 P.M. in the Registrar's Office for doctoral students applying for June degrees.
June 7, Thursday
Commencement.
August 13, Monday
Deadline for filing degree applications for degree in November 1984.

Degree Calendar

For a degree to be awarded	Degree applications due in Registrar's Office on Monday	Bound theses due by 3:00 P.M. in the Registrar's Office on Wednesday
November 21, 1983	August 15, 1983	November 9, 1983
March 19, 1984	November 28, 1983	February 15, 1984
June 6, 1984*	April 2, 1984	May 30, 1984

*Degrees conferred June 7, 1984—Commencement

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Howard H. Hiatt, Dean of the Faculty of the School of Public Health, left, and Elkan R. Blout, Dean for Academic Affairs, right.

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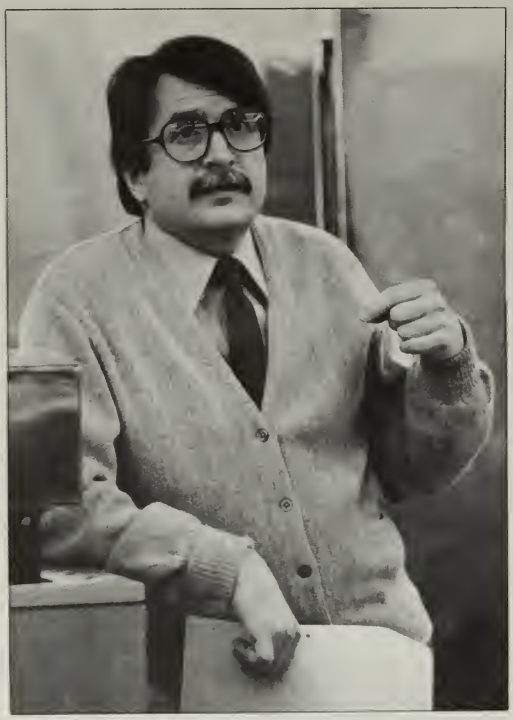
Jay Andrew Winsten, A.B., Ph.D., Director of the Office of the Health Policy Information



Dr. Richard Monson, Professor of Epidemiology, Director of Admissions, and Director of the Educational Resource Center for Occupational Safety and Health.

Dr. Margaret Drolette, second from left, Dr. Alan Sheldon, and Dr. Mark Boyer, coordinators of the MPH Program, with staff assistants Ruth Steinbrecher, far left, and Janie Cordell.

Facing page, Dr. James Liljestrand, President of the Alumni Association, at the School's Commencement ceremony.

DEGREE REQUIREMENTS

The School of Public Health offers programs leading to the graduate degrees of *Master of Public Health* (M.P.H.), *Doctor of Public Health* (Dr.P.H.), *Master of Occupational Health* (M.O.H.), *Master of Science* in a specified field (S.M. in . . .), and *Doctor of Science* (S.D.). The general degree requirements and the respective requirements for admission are discussed in the following sections.

Master of Public Health

The program leading to the Master of Public Health degree consists of one academic year of study designed to prepare professionals for careers in public health practice. Through the core curriculum, the program provides a broad background in various disciplines basic to public health. Through the choice of elective courses students may acquire more breadth of knowledge or may pursue in some depth one or more areas of particular relevance to their career goals. The M.P.H. degree program may serve as a required academic year for residency training in General Preventive Medicine and Occupational Medicine (see p. 27).

Requirements for Admission

Applicants to the M.P.H. program must satisfy the Committee on Admissions and Degrees as to their academic ability, the relevance of their previous education and experience, and their overall qualifications for graduate professional education in public health. Ordinarily, an applicant should hold a doctoral degree in medicine, dentistry, or veterinary medicine. Consideration is also given to applicants who hold doctoral degrees in biology, behavioral sciences, other natural sciences and social sciences, or law, economics, engineering, and certain related fields regarded by the School as appropriate background for entrance into the public health profession. Applicants who hold an earned doctoral degree are urged to submit scores from the Aptitude Test of the Graduate Record Examination (GRE) or other aptitude tests such as the Law School Admission Test (LSAT), the Medical College Admission Test (MCAT), or the Dental Aptitude Test (DAT), if available.

Consideration for admission to the M.P.H. program is given also to an applicant who holds a master's degree in a field related to public health such as nursing or social work, with a highly distinguished academic record, and substantial professional experience (usually at least three years in an administrative position of responsibility). These applicants must be able to demonstrate sufficient knowledge and competence to satisfy the Committee on Admissions and Degrees as to their qualifications for professional public health education and must submit scores from the Aptitude Test of the Graduate Record Examination. Scores from the GRE Aptitude Test should be no more than five years old.

Applicants from countries where English is not the language of instruction must submit a score from the Test of English as a Foreign Language (TOEFL). Ordinarily, the TOEFL score must be 550 or better before the applicant can be considered for admission.

If a student who is enrolled in the M.P.H. program wishes to continue at the School after completing the M.P.H., he or she may consider applying for a Master of Science or doctoral program in any of the departments which offer such programs for which he or she meets the requirements. Interested students should refer to the section on admissions for procedures and application deadlines.

Requirements for the Degree

An M.P.H. degree candidate must spend one academic year in residence at the University and must successfully complete courses totaling a minimum of 40 credit units. Students will be encouraged to take a total of 45 to 50 credit units.

Candidates for the M.P.H. degree are expected to complete the requirements in one academic year of full-time study. In rare instances, upon written request to the Committee on Admissions and Degrees, a student may be allowed to complete the program over a period of two academic years. The M.P.H. core courses must be completed in the first year.

Students who have taken courses at the School prior to entrance into this degree program may be able to use those courses to satisfy specific M.P.H. or departmental course requirements, but they must still complete a minimum of 40 credit units as degree candidates. In any event, students are required to pay one full year of tuition.

The Core Curriculum

The core curriculum, required of *all* M.P.H. degree candidates, is designed to provide a fundamental knowledge of the major areas of public health. Students must take the four core courses which cover the environment, quantitative methods, and health administration and management. In addition, students select one course that uses the case method to integrate the various disciplines of public health. The core courses are:

ESP 201a or 201c Principles of Environmental Health I (2.5 credit units) plus either 202b Principles of Environmental Health II (2.5 credit units) or 203d Principles of Environmental Health III (2.5 credit units)

BIO 201a,b Principles of Biostatistics (5 credit units)

EPI 201a Epidemiology in Public Health (2.5 credit units)

HPM 221a,b Managing Health Delivery Organizations (5 credit units)

AND a case studies course. A list of case studies courses will be provided before registration.

Ordinarily, the core courses represent less than half of the total number of credit units recommended for the degree, thus allowing for flexibility in the program. Descriptions of each course appear in the section, *Courses of Instruction*.

Master of Public Health Program Office

Chief Coordinator: Dr. Drolette
Coordinators: Dr. Boyer and Dr. Sheldon

The coordinators have day-to-day responsibility for the M.P.H. degree program, oversee the core curriculum, and serve as the M.P.H. Subcommittee of the Committee on Admissions and Degrees. They meet

regularly with the Master of Public Health Program Committee, composed of a faculty representative of each department at the School, and representatives of students, alumni, and the School administration. The M.P.H. Program Office, located in the Office of Student Affairs, serves as a departmental office for students in the General Program, and provides a central source of information about the M.P.H. degree program to all students and applicants.

Departmental Concentrations

The M.P.H. is an interdisciplinary degree and does not carry a departmental designation. Many students have specialized goals and choose to take most of their elective courses in one department. They often prefer to concentrate in that department. Departments differ in their expectations of M.P.H. degree candidates. Some advise them to take a specific set of courses over and above the M.P.H. core curriculum, while others determine students' needs on an individual basis. For further information about a specific departmental concentration, please check with the department.

The General Program

The General Program, under the direction of the coordinators of the M.P.H. program, takes cognizance of the fact that many students seek a broader view of public health than that which a departmental affiliation offers. Students in the General Program may choose their elective courses from a variety of courses offered by the School of Public Health and other faculties at Harvard and M.I.T. Faculty advisors are assigned with each student's background and interests in mind. Members of the M.P.H. Committee serve as advisors to most of the students in the General Program. Even within the General Program it is possible for a student to concentrate to some extent in a particular discipline through the appropriate choice of electives.

Combined Degree Programs

Students currently enrolled in an M.D., D.M.D., D.D.S., or D.V.M. program may apply for admission to the M.P.H. program, provided that a combined program can be arranged that meets the approval of both the Committee on Admissions and Degrees at the School of Public Health and the institution from which the doctoral degree is being earned. Students usually apply in their second or third year of medical, dental, or veterinary school for enrollment in their third or fourth year. Requirements for the M.P.H. degree (described on p. 19) are the same for students in the combined degree program as for all other M.P.H. degree candidates. Students enrolled in a combined degree program with the M.P.H. will receive the M.P.H. upon successful completion of both degree programs and conferral of the doctoral degree.

Doctor of Public Health

The Doctor of Public Health is an advanced professional degree for those who intend to pursue academic or research careers in public health, including administrative, planning, or evaluation roles in public health practice. The degree is granted on successful completion of an

approved program of independent and original investigation in a special field of public health and the presentation of the results of this research in an acceptable thesis.

Requirements for Admission

An applicant for admission to candidacy for the Doctor of Public Health degree normally must be a graduate of an approved school of medicine, dental medicine, or veterinary medicine. Depending on the intended field of specialization, consideration may also be given to a candidate who holds an advanced degree in one of the disciplines basic to public health. In addition, the applicant must hold, or be in progress toward, the degree of Master of Public Health, or its equivalent, from an approved institution.

Applicants must be able to satisfy the Committee on Admissions and Degrees as to their overall qualifications for doctoral study at the School and must demonstrate potential ability to undertake original investigation in a special field. Scores for the Aptitude Test of the Graduate Record Examination must be submitted by all applicants who do not hold an earned doctoral degree and should be no more than five years old.

Applicants who hold an earned doctoral degree are urged to submit aptitude scores from the GRE, or other tests such as LSAT, MCAT, or DAT, if available.

Requirements for the Degree

Formal requirements for the Doctor of Public Health degree are the same as those for the Doctor of Science degree. A brief summary of these requirements appears on p. 25.

Master of Occupational Health

The program leading to the Master of Occupational Health degree is designed to provide physicians with postgraduate training in the public health disciplines that
prevent occupational disease and injury. This one-year degree program is usually taken as part of a two-year approved residency in occupational medicine. Please refer to the Occupational Medicine section under the listing for the *Educational Resource Center for Occupational Safety and Health.*

Requirements for Admission

Candidates must be graduates of an approved school of medicine and must satisfy the Committee on Admissions and Degrees as to their scholastic ability to study at the graduate level. Students from the United States must have completed an internship or residency of at least twelve months in a hospital approved by the American Medical Association. Applicants are urged to submit scores from the Medical College Admissions Test (MCAT) or the scores of the Aptitude Test of the Graduate Record Examination (GRE), if the latter are available.

Requirements for the Degree

Candidates for the M.O.H. degree must spend one academic year in residence at the University and must successfully complete a program of at least 40 credit units, comprising both required and elective courses.

All candidates are expected to take the following courses unless they can demonstrate equivalent preparation:

1. Biostatistics 201a,b, *Principles of Biostatistics* (5 credit units)
2. Epidemiology 201a, *Epidemiology in Public Health* (2.5 credit units)
3. Toxicology 205a,b, *Principles of Toxicology* (5 credit units) or Cancer Biology 207c,d, *Radiation Biology* (5 credit units)
4. Environmental Science and Physiology 231a,b, *Policy Issues in Occupational Health* (5 credit units)
5. Environmental Science and Physiology 234d, *Basic Problems in Occupational Health and Industrial Environments* (2.5 credit units)
6. Epidemiology 202b, *Principles of Epidemiology I: Elements of Study Design and Data Analysis* (2.5 credit units) or Epidemiology 215c,d, *Environmental and Occupational Epidemiology* (2.5 credit units)
7. Environmental Science and Physiology 251a, *Health Hazards of Manufacturing Processes* (2.5 credit units)
8. Environmental Science and Physiology 252b, *Introduction to Industrial Hygiene* (2.5 credit units)
9. Biostatistics 202c,d, *Statistical Methods for Epidemiologic Research* (5 credit units) or Biostatistics 203c,d, *Statistical Methods in Experimental Research* (5 credit units). Not required, but strongly recommended.

The total number of credits in required courses is 27.50. Additional courses may be selected from the curriculum approved for residencies in occupational medicine.

Master and Doctor of Science

The School offers programs leading to the degrees of Master of Science in designated fields of concentration and Doctor of Science. The prospective applicant should note that in some areas, the Master of Science program is intended primarily or wholly as preparation for doctoral study; applicants are screened for their interest in, and potential for, doctoral work, and the majority of students continue toward the Doctor of Science degree. In other areas, the Master of Science is viewed primarily or wholly as a professional degree; while a small percentage of students may continue for the doctorate, the majority discontinue study upon receipt of the S.M. degree. Finally, students in still other areas are divided almost equally between those who pursue the Doctor of Science degree and those who discontinue their studies upon receipt of the S.M. degree.

Occasionally, a student may be admitted to a master's program or to candidacy for a doctoral degree in more than one of the disciplines, if the program meets the requirements of the respective departments or programs involved. In such instances, the degree conferred specifies the areas.

Because there is considerable variability among the S.M. and S.D. programs in different fields, both in their overall goals and their specific admission and degree requirements, applicants are urged to consult the program descriptions. These descriptions provide basic information about programs in specific areas; additional information may be obtained by contacting the respective departments or programs, as indicated in the degree designation.

Master of Science in Specified Field

In general, the programs leading to the degree of Master of Science in a specified field of concentration are designed for students with interests in the scientific basis of public health and preventive medicine. The degree is granted upon fulfillment of a program of advanced work in the public health disciplines represented by departments and certain programs in the School. Students may be admitted to either a one- or a two-year master's program, depending upon the requirements of the particular program. Information about requirements for one- and two-year programs in various areas is included in the program descriptions.

Requirements for Admission

Applicants to Master of Science degree programs must satisfy the Committee on Admissions and Degrees as to their overall qualifications and promise for successful graduate study at the School. Applicants must also satisfy the department or program to which admission is sought that they have an adequate academic and/or professional background appropriate for specialization in that field.

Conditions of eligibility for one-year or two-year programs vary with the area or department in which a student wishes to specialize. Prospective applicants should consult program descriptions for more specific information.

Generally, eligibility for admission to a one-year program is limited to graduates of approved schools of medicine, dentistry, or veterinary medicine, or to applicants who have earned doctoral or, for some programs, master's degrees in fields acceptable to the department(s) to which admission is sought. Applicants holding master's degrees may be considered for admission to one-year or to two-year programs, depending upon their prior educational and professional background and upon the particular requirements of the program to which they wish to apply.

An applicant holding a baccalaureate degree is normally considered for admission to a two-year program, in order to complete the requirements for a Master of Science degree. For a few programs, including industrial hygiene, air pollution control, and radiological health, applicants may be considered for a one-year program if they hold a bachelor's degree with adequate scientific and engineering training and if they have had at least two years of relevant professional experience in the field of specialization.

Occasionally, a year or more of appropriate graduate work in an approved institution may enable a student to fulfill two-year program requirements in one year. In some cases, however, program require-

ments are such that a student must spend one-and-a-half or two years in residence in order to complete the necessary courses, regardless of prior training and experience.

All candidates for admission to a Master of Science program, who do not hold an earned doctoral degree, must submit scores from the Aptitude Test of the Graduate Record Examination. Applicants who hold an earned doctoral degree are urged to submit scores from the GRE or other tests such as the Law School Admission Test (LSAT), the Medical College Admission Test (MCAT), or the Dental Aptitude Test (DAT), if available.

The GRE is required for *all* applicants to the Department of Health Policy and Management except physicians, dentists, and medical or dental students applying for the Medical/Dental Track who may submit the MCAT or DAT scores.

Applicants are advised to take the Graduate Record Examination no later than the December test administration date. In order to expedite the admissions process, applicants who have taken the Graduate Record Examination in a prior academic year are advised to send a photocopy of their own G.R.E. "Report to the Candidate" when returning their completed application form. GRE scores submitted should be no more than five years old. An official score report must be received from the Educational Testing Service before final action will be taken on the application. Additional information concerning the Graduate Record Examination requirement is included in the instructions accompanying the application form.

Requirements for the Degree

Students admitted to a one-year program must spend a minimum of one academic year in residence at the University and must successfully complete a program of at least 40 credit units. Students admitted to a two-year program must spend two academic years in residence and must successfully complete a program of at least 80 credit units.

While specific course requirements vary from program to program, all candidates for a Master of Science degree are required to take Biostatistics 201a,b and Epidemiology 201a, unless they can demonstrate equivalent preparation. Candidates who do not have a background in medicine or biology are advised to take Environmental Health and Physiology 205a,b, or its equivalent, or a course in general biology elsewhere. Beyond these minimal course requirements, each program may specify additional courses that are necessary for satisfactory fulfillment of degree requirements in the particular area of specialization. These specific course requirements are generally *not* listed in this catalog. The student should consult with his or her adviser or department or program head about these requirements before deciding which courses to take.

Combined Degree Programs

The admission and degree requirements for the Master of Science degree are the same as those listed for Master of Public Health degree.

Doctor of Science

The Doctor of Science degree is an advanced graduate degree for those who intend to pursue academic or research careers in public health. The degree is granted on successful completion of a program of independent and original research in one of the basic disciplines of public health, and upon the presentation of this research in an acceptable thesis.

Requirements for Admission

Applicants for admission to candidacy for a Doctor of Science degree must satisfy the Committee on Admissions and Degrees and the department of specialization as to their overall qualifications for doctoral study and their ability to undertake original research in their chosen field. All candidates for a Doctor of Science degree must hold a baccalaureate degree. In some instances, an applicant will be expected to complete the Master of Science degree at the School before being granted admission to doctoral study. In such cases, the student will first be admitted to a Master of Science program. Scores for the Aptitude Test of the Graduate Record Examination must be submitted by all applicants to doctoral programs, who do not hold earned doctoral degrees, and should be no more than five years old. Applicants who hold an earned doctoral degree are urged to submit Aptitude Test scores from the GRE, or LSAT, MCAT, or DAT tests, if available.

Because specific prerequisites vary with the discipline or field of specialization, prospective applicants are urged to consult the program descriptions in this *Register* and the department or program to which admission is sought for more detailed information.

Requirements for the Degree

A minimum of two academic years of full-time study in residence at the University is required of students enrolled in the doctoral program. The required work and preparation of an acceptable thesis, however, ordinarily takes longer. Residence requirements are fulfilled by payment of tuition (see p. 94) and pursuit of an academic program approved by the department of concentration and the Committee on Admissions and Degrees.

The Committee on Admissions and Degrees is responsible for overseeing the programs of all doctoral students. During the registration period each new doctoral student will receive a manual detailing the principles and procedures that are to be followed. A brief summary of requirements is given below.

Each doctoral student is required to take 40 to 60 credits in graduate-level courses distributed over a major and two minor fields. Each minor field will ordinarily consist of at least 10 credits in formal courses. Such requirements may be reduced in cases of prior relevant course work or experience. They may be increased in cases where there has been a substantial shift in field. Courses in the major and minor fields must be completed with distinction, with grades of "A" or "B." Unless equivalent preparation can be demonstrated, doctoral students must take

Epidemiology 201a as well as courses in biostatistics through the intermediate level (ordinarily BIO 202c,d). Departments may stipulate specific course requirements and may require written and/or oral examinations on the course work in the three fields.

Qualifying Examination

By the end of the second year the student should be prepared to take the oral qualifying examination. The main emphasis of this examination is to assess the student's potential to perform research in his/her chosen field. Since most doctoral research in the School requires a substantive knowledge of more than one discipline or field, the examining committee will include faculty from disciplines representing the minor fields as well as the major. The examination will include questioning in the major and minor fields outside of the proposed research.

A research committee consisting of the student's adviser and other faculty members is to be appointed within one month after the qualifying examination is passed. This committee has the responsibility for guiding the student's research through to completion. It will meet with the student at least once every six months to discuss details of the student's progress.

Thesis

An acceptable thesis must ordinarily be submitted within five years of the date of registration as a doctoral candidate. The thesis should consist of one or more manuscripts suitable for publication in a scientific medium appropriate to the candidate's field. Detailed requirements are available from the Registrar.

The thesis will not be accepted until a public presentation and discussion has been held, with the research committee in attendance.

Three bound copies of the approved thesis must be in the Registrar's Office before the faculty will vote the degree at their regular meetings in October, February, or June.

Occasionally, thesis work will be performed *in nonresident* status. Before the doctoral subcommittee of the CAD grants such status, it is necessary that the research committee meet with the candidate to appraise the thesis plan. Agreement must be reached and the doctoral subcommittee must be advised in writing *before departure of the student* as to (1) acceptability and feasibility of the proposed thesis plan; (2) the timing and scope of the periodic written reports that will be required of the student; (3) arrangements that have been made or will be made for direct field supervision of the student; and (4) the minimum period of time the student will spend back at the School before the presentation and defense of the thesis. In no case will the doctoral subcommittee grant *in nonresident* status for more than one year at a time.

Students wishing further information on doctoral program requirements should refer to the *Guidelines for Doctoral Study* available in the Registrar's Office.

Residency for Board Certification

The School offers approved residency training leading to certification by the American Board of Preventive Medicine in the following areas:

General Preventive Medicine, in the specialty areas of
- Epidemiology
- Health Services Administration
- International Health

Occupational Medicine

For physicians who apply and who are accepted into a General Preventive Medicine or Occupational Medicine Residency, credit is given for one or two years of study leading to one or more public health degrees. A residency may also include supervised experience which may or may not be part of a degree program.

Additional information about the residency programs may be obtained from Dr. Brian MacMahon, Chairman of the Department of Epidemiology (for the specialty areas of epidemiology and health services administration of the General Preventive Medicine residency); Dr. M. G. Herrera-Acena, Associate Professor of Medicine in the Department of Nutrition (for the specialty area of international health of the General Preventive Medicine residency); and Dr. Edward Baker, Associate Professor of Occupational Medicine (for the Occupational Medicine residency).

Some financial support may be available through traineeships or National Research Service awards for degree programs (U.S. citizenship or permanent residence status required). Further information on financial aid can be obtained from the individuals listed above, or from Ms. Margaret C. Salmon, Director of Financial Aid.

Postdoctoral Fellowship Program in Dental Public Health and Dental Care Administration

The School of Dental Medicine, in cooperation with the School of Public Health and the Massachusetts Department of Public Health, offers a program covering three academic years of postdoctoral study, intended to prepare a limited number of individuals for creative full-time teaching, research, and/or administrative careers in dental public health and dental care organization. Each person accepted into the program will be appointed as a Clinical or Research Fellow in Dental Care Administration at the School of Dental Medicine. The program is open to dentists and other qualified health professionals.

The program is in three parts of approximately one year each, which need not be completed in succession. One part of the program involves a formal course leading to a degree of Master of Public Health. The M.P.H. core courses must be completed in the first year at the School of Public Health and all requirements for the Master of Public Health degree in a maximum of two academic years. Candidates with an

M.P.H. or equivalent from another school, however, may be accepted into the Postdoctoral Fellowship Program with one year advanced standing. The second portion involves a one-year supervised residency at the community, state, or national level in health policy and administration. This residency meets the requirements of the American Board of Dental Public Health. The third portion affords opportunity for advanced didactic work and research at the School of Dental Medicine, the School of Public Health, other departments of the University, and/or other institutions. Epidemiological or health services research can be carried on over the entire three-year period in a variety of situations involving either new or continued studies. A research thesis is prepared for presentation at the end of the third year.

Fellows in Dental Care Administration who wish to become candidates for a degree in public health must meet the admission requirements of and be accepted into the School of Public Health. Application should be made directly to the School of Dental Medicine, whose Committee on Postdoctoral Education will forward the applicant's file to the School of Public Health for consideration.

Upon successful completion of this program, the candidate will receive the M.P.H. degree from the School of Public Health, as well as a Certificate of Postdoctoral Study in Dental Care Administration and a certificate of completion of residency requirements from the Harvard School of Dental Medicine.

Academic study beyond the master's level may be arranged with the School of Public Health and other departments of the University.

For further information and application forms, write to the Head, Committee on Postdoctoral Education, Harvard School of Dental Medicine, 188 Longwood Avenue, Boston, Massachusetts 02115.

Facing page, Dr. Steven Gortmaker, Assistant Professor of Sociology, and Acting Chairman of the Department of Behavioral Sciences.

DEPARTMENTS AND PROGRAMS

Department of Behavioral Sciences

Steven L. Gortmaker, A.B., S.M., Ph.D., Assistant Professor of Sociology and Acting Chairman of the Department

Faculty Professor Pierce; Visiting Professor Mertens; Associate Professors Masnick and McAuliffe; Assistant Professors Babor and D. Walker; Lecturer Wechsler

Teaching and Research Staff Visiting Lecturers Friedman and Levine; Lecturers Benfari and Hall; Instructors Daltroy and McArdle

Introduction The Department of Behavioral Sciences seeks to train researchers, teachers and professionals in the knowledge and analytical skills of the behavioral sciences relevant to significant public health issues. The specific focal points for teaching and research are: (1) health promotion and education programs; (2) the influences of behavior on health and disease; (3) behavioral pathologies, including addiction to drugs and alcohol, mental illness, and child abuse; (4) behavioral aspects of health services, including psycho-social factors affecting the utilization of services and compliance with medical regimens, as well as the behavior of health professionals; and (5) social science methodologies as applied to public health problems and the evaluation of health services and programs.

Degrees Master of Public Health with concentration in Behavioral Sciences; Master of Science in Behavioral Sciences; and Doctor of Science.

Research Current projects include research on opiate addiction among street addicts, recovering medical professionals and medical patients. The efficacy of self-help groups in preventing relapse in heroin addicts is being experimentally evaluated in Boston and Hong Kong. The study also seeks to learn the causes of relapse and how treatment programs may be improved.

A four-year evaluation of the Robert Wood Johnson Foundation's Rural Infant Care Program is examining the success of these programs in reducing infant morbidity and mortality.

Services used by youth and their families before, during, and after runaways occur are being studied in five sites across the country.

An in-depth longitudinal study of developmental processes and "at-risk" health behaviors of school-aged pregnant women and adolescent parents is being conducted in the metropolitan Boston area. Research exploring the relationships among social supports, the availability and use of community services, family organizations, and the management and functioning of children with chronic illness is ongoing, using data collected from the Community Child Health Studies in three communities: Flint, Michigan; Cleveland, Ohio; and Berkshire County, Massachusetts.

The Harvard unit of the nation-wide Multiple Risk Factor Intervention Trial (MRFIT) has completed ten years of research testing of the hypothesis that mortality from coronary heart disease can be reduced by altering the risk factors of elevated blood pressure, elevated blood choles-

terol, and cigarette smoking. Published analyses show substantial reductions in all three risk factors.

Data collected from the Field Study of Youth Health Promotion Processes are being analyzed to determine how unhealthy life-styles are adopted and what intervention can prevent the onset of smoking, alcohol and drug abuse. Research was done in inner city and suburban schools in Boston and in two small towns in California, in collaboration with researchers at Stanford University.

Recent research has examined the area of health training and the role of stress and social support systems in the use of primary care health services.

Programs

Goals

Designed to train persons in the behavioral aspects of health and health services. Students learn research skills, techniques of applying behavioral sciences to public health issues, and relevant elements of behavioral disciplines.

Curriculum

Master's candidates do course work in areas of health and behavior, health promotion/education, behavioral aspects of health services, and behavioral pathologies. Doctoral students are expected to develop expertise in three major areas of behavioral sciences, research methods and statistical computing, and an area of specialization such as the self-help approach to alcohol and drug treatment; smoking prevention; and models of contraceptive behavior.

Admission

Applicants for the doctoral program must have a baccalaureate degree in a related behavioral sciences discipline. These individuals are admitted directly into the doctoral program.

Career Outlook

Recent graduates have taken research and teaching positions in major health institutions and academic settings.

Some of the courses that the Department offers are described on page 114.

Department of Biostatistics

Marvin Zelen, S.B., A.M., Ph.D., Professor of Statistical Science and Chairman of the Department

Faculty Professors Drolette, Miettinen, Mosteller, and Weinstein; Associate and Visiting Associate Professors Begg, Harrington, Lagakos, Laird, Lavin, Louis, Pagano, Schoenfeld, Tsiatis, and Ware; Assistant Professors Amato, Anderson, Feldman, Feldstein, Finkelstein, Gelber, Gelman, Larson, Mehta, Stanley, and Tritchler; Lecturers Bailar, Kent, and Neff; Emeritus Professor Reed

Teaching and Research Staff Lecturers MacIntyre, McFadden, Simes, Waternaux, and Wyshak

Introduction The Biostatistics program is designed to prepare students for careers which contribute to the theory and practice of statistical science as applied to the Health Sciences. Many unique opportunities exist to participate in methodological research and interdisciplinary collaborations.

Degrees The graduate program offers three courses of study leading to the Master of Science degree, as well as Doctor of Science and Doctor of Public Health degrees.

Activities of the Department The Department carries on a broad program of research activities in Biostatistical Science. During the 1982-83 academic year, there were working seminars meeting throughout the year on Risk Assessment, Clinical Trials, Carcinogenicity Experiments, Early Detection of Disease, Statistical Computing, and Applications of Statistical Decision Theory to Clinical Problems.

Current areas of emphasis include: *Environmental Health* — The Department engages in interdisciplinary research in health effects of air pollution, carcinogenesis testing, and environmental monitoring. Recent studies have investigated cancer incidence near hazardous waste disposal sites, the carcinogenic effects of food dyes, and the effects of particulate air pollution on respiratory health among children. *Computing* — Members of the Department are involved in research on statistical computing algorithms and data-base management. The School of Public Health has excellent computing facilities and supports all of the commonly used statistical packages. Much of the Department's research on statistical software is carried out on the computing facilities at the Dana Farber Cancer Institute. *Medical Statistics and Clinical Trials* — The Department has a major commitment to collaborative clinical research in the treatment of cancer and cardiovascular disease. The faculty includes leaders in the development of statistical and computing methods for clinical trials, including sequential methods, survival data analysis, and data base management. Members of the Department are involved in more than 100 national and international clinical trials currently in progress. *Health Policy and Decision Sciences* — The Department engages in research on quantitative problems in health policy and clinical decision making. Faculty members are investigating new methods for assessing risks and benefits associated with environmental regula-

tions; costs, risks, and benefits of clinical practices and medical technologies; and the impact of organizational structure on decision making. The Department maintains a close relationship with the Center for the Analysis of Health Practices and the Department of Health Policy and Management. *World Health Organization* — The Department has been designated as a Biostatistics Evaluation Center by the World Health Organization. This activity is aimed at cancer control activities with special attention to the developing countries of the world. *Consulting* — The Department participates in a wide variety of medical research projects through the Biostatistics Consulting Laboratory. Students are expected to develop consultative and data analytic skills through participation in these consulting projects.

Programs

The One- and Two-Year Master's Programs, leading to the S.M. in Biostatistics, provide rigorous training and practical experience in statistical methods. One can also obtain an S.M. which is joint with another Department. Students enrolled in the School's M.P.H. Program may concentrate in Biostatistics.

Course work includes the mathematical basis of statistical inference; statistical methodology, epidemiology, and computing; and a selection from courses in biomedical sciences and health policy and management. Besides course work, students are given experience in consulting and computing and the opportunity to teach in the Department's Schoolwide courses.

Candidates should have preparation in calculus and linear algebra. The one-year program is limited to students who already have a graduate degree in one of the mathematical sciences or who are unusually well prepared.

The Doctoral Program, leading to a Doctor of Public Health or Doctor of Science degree, aims to develop the capability for research and scholarship as well as providing a rigorous training in statistical practice.

Doctoral students may concentrate on either a Theoretical Track or an Applied Track. In 1982, the new program in Applied Biomedical Computing was started (see below). Course work includes the mathematical foundations of statistical inference, statistical methodology, epidemiology, and computing. Students on the Applied Track develop expertise in an allied field of public health. The students also gain experience in consulting, computing, and teaching.

In the second year of course work, doctoral candidates are expected to take a comprehensive written examination and make an oral presentation of research plans. The doctoral thesis may include either original contributions to statistical methodology related to the health sciences or innovative application to a field of public health or medicine.

Students may enter the doctoral program through the master's program or can enter the doctoral program directly.

The Applied Biomedical Computing Program aims to acquaint students with both hardware and software and to train them in areas of application

which are important in biomedical research. Besides the required courses in biostatistics and epidemiology, students in this program will take courses in computer operating systems, software engineering, database management, graphics, and laboratory science. They will also gain practical experience in biomedical computing in one of the Harvard-affiliated hospitals.

Both master's and doctoral degrees are offered in Biostatistics with special concentration in the Biomedical Computing Program. Admission, course work, and dissertation requirements are as described above.

Course Offerings

Courses offered by the Department cover a broad range with respect to mathematical sophistication and disciplinary focus.

Elementary courses assume little background in mathematics and are designed for a wide audience. They aim to develop facility in quantitative reasoning, a command of basic methodology, and a critical appreciation of good statistical practice in the health sciences. BIO 201 is a School-wide requirement. (For students in Health Policy and Management, BIO 219 is substituted.) The other elementary courses are BIO 111, 112, and 113.

Intermediate courses are designed to develop methodological skills in specific areas of application, such as epidemiology, health policy, and experimental science. At least one intermediate course is a School-wide requirement for doctoral students. The intermediate courses are BIO 202, 203, 204, 205, 207, 208, 211, 214, 216, 220, 251, 273, 275, and 285.

Advanced courses require a background in mathematics and are primarily intended for degree candidates in Biostatistics. The advanced courses are BIO 209, 210, 217, 218, 240, 261, 262, 263, and 274. Students may also take courses in the Department of Statistics and at the Massachusetts Institute of Technology.

Admission

See specific requirements on p. 23 (S.M.) and p. 25 (S.D.).

Career Outlook

The career outlook for biostatisticians is very promising. Biostatistics graduates have secured positions in government, universities, industry, and public health centers. Statisticians are needed in the broadly defined areas of medical care, drug therapy, health maintenance, environmental control, and health care administration. The 1978 report on professional employment needs, issued by the National Academy of Science, indicated a critical shortage of biostatisticians and epidemiologists with graduate degrees. This report also noted that shortages were likely to continue for the next five years.

Some of the courses that the Department offers are described on page 116.

Above right, Dr. Nancy Gutensohn, Assistant Professor of Epidemiology. Below, Dr. Marcello Pagano, Associate Professor of Biostatistics and Dr. Margaret Drolette, Professor of Biostatistics.

Department of Cancer Biology

M. E. Essex, D.V.M., Ph.D., Professor of Microbiology and Chairman of the Department

Faculty

Professors Cairns and Little; Visiting Professor de-The; Associate Professors Falk, Greene, Haseltine, Kennedy and Weichselbaum; Assistant Professors Eisenstadt, Grant, Mullins and Reynolds

Teaching and Research Staff

Visiting Lecturers Cotter, Dressler, Fiumara, Grady and Werner; Research Associates Azocar, Henson, Logan, Miller, Nagasawa, Schwartz, Umans and Vetrovs

Introduction

Research in the Department of Cancer Biology is primarily involved with cancer etiology. Training programs leading to the Doctor of Science degree are emphasized. The Department also participates in the professional degree programs offered by the School, for those interested. Doctoral training areas include basic and applied research in virology, immunology, cancer biology, and radiobiology. Please see individual laboratory listings for more specific research goals.

A collegial atmosphere prevails among the faculty and students. Students are encouraged to participate in the numerous seminar series and informal discussion groups the Harvard Medical Area has to offer. Course work is available in several areas of microbiology, in biochemistry and in cell biology at the Harvard Medical School, other schools within Harvard University, or at the Massachusetts Institute of Technology, in addition to the offerings of the Department and the School.

The Department also maintains a relationship with the Massachusetts State Laboratory Institute, and is involved in joint research efforts with some of our associates at that Institute.

Degree

Doctor of Science. (Please see degree requirements on p. 25.)

Curriculum

Course work during the first one to two years emphasizes cancer biology, cellular and molecular biology, virology, immunology, radiation biology, cancer biology and genetics, as well as develops the basic skills in laboratory techniques and data handling necessary for undertaking original research. The latter part of the program involves intensive laboratory reseaarch under the guidance of a faculty advisor.

Career Outlook

Our recent graduates have accepted research and/or teaching positions with public and private academic institutions, with governmental agencies such as the National Institutes of Health and the Centers for Disease Control, and with private industry.

Publication

Emphasis is placed on publication of research in the standard research literature. In most cases this is a departmental requirement, and most of our doctoral students publish several good papers before they complete the degree.

Research

Laboratory of Carcinogenesis

This program offers doctoral level training in the cellular and molecular effects of chemical carcinogenesis in preparation for research careers in cancer biology. Some areas of ongoing research in this area include study of the precise changes in DNA sequences produced by the main categories of chemical carcinogens and study of the general mechanisms of mutagenesis and DNA repair.

Information regarding the program in carcinogenesis may be obtained by writing Professor John Cairns, Director, Laboratory of Carcinogenesis, Department of Cancer Biology, 665 Huntington Avenue, Boston, MA 02115. A personal interview is strongly encouraged.

Laboratory of Radiobiology

This program offers doctoral level training in the cellular and molecular effects of radiation in preparation for research careers in radiation biology and experimental carcinogenesis. Some areas of ongoing research in the program include the study of: the induction and mutations and malignant transformation in mammalian cells by low and high LET radiations and by chemical agents; radiation-induced DNA damage and repair processes at the cellular and molecular levels; cytogenetic effects of radiation and chemical pollutants; and the effects of radiation in human diploid cells from cancer-prone patients.

Information regarding the program in radiobiology may be obtained by writing Professor John B. Little, Director, Laboratory of Radiobiology, Department of Cancer Biology, 665 Huntington Avenue, Boston, MA 02115. A personal interview is strongly encouraged.

Laboratory of Virology, Immunology and Molecular Genetics

This program offers doctoral level training in the immunology, molecular biology, and epidemiology of infectious disease agents, especially viruses associated with cancer. Some areas of ongoing research in the program include the study of: the role of viruses in the cause of cancer, including hepatitis B virus and human liver cancer, and RNA tumor viruses as causes of leukemias, lymphomas, other tumors and immunosuppressive disorders of animals and man; tumor immunology; monoclonal antibodies; the molecular biology of cancer; gene regulation; and genetic events associated with leukemia and metastasis.

Information regarding the program in virology, immunology and molecular genetics may be obtained by writing Professor M. Essex, Chairman, Department of Cancer Biology, 665 Huntington Avenue, Boston, MA 02115. A personal interview is strongly encouraged.

Some of the courses that the Department offers are described on page 120.

Department of Environmental Science and Physiology

Joseph J. Harrington, B.C.E., A.M., Ph.D., Professor of Environmental Health Engineering in the Faculty of Public Health, Gordon McKay Professor of Environmental Engineering in the Faculty of Arts and Sciences, and Chairman of the Department

Faculty

Professors Brain, Ferris, First, Hornig, Mead, Moeller, and Monson; Visiting Professor Lansing; Associate Professors Baker, Burgess, Dennis, Drazen, D. E. Leith, D. H. Leith, Smith, Speizer, and Spengler; Assistant Professors Banzett, Boden, Butler, Ellenbecker, H. A. Feldman, Greaves, Keyserling, Loring, Robins, and Valberg; Lecturers Bjarngard, Cudworth, Judy, Murphy, Shapiro, Snook, and Webster; Emeritus Professor Whittenberger

Teaching and Research Staff

Lecturers and Visiting Lecturers Arndt, Bracken, Christiani, Corley, Douglass, Egan, R. Feldman, Forster, Gonzalez, Jaeger, Kern, Landrigan, Levy, Mahoney, Murphy, Oliver, Selby, Storm, and Varner; Instructor Goldman; Research Associates B. Beck, J. Beck, Dockery, Eisen, Evans, Gute, Hammond, Hoppin, Kimball, Letz, Levenstein, McGandy, Parod, Rudnick, Ryan, J. Smith, Sweeney, and Wolfson

Introduction

With growing public awareness of the need for environmental pollution control and worker protection, increasing attention is being focused on these problems at all levels of our society. There are five specialized programs offered by the newly reorganized Department of Environmental Science and Physiology. The mechanisms of action and the adverse health effects of chemical and physical factors in occupational and community settings are typical problems that are central to the Department's interests. Such reseaarch provides the basis for prevention and control.

The problems are very complex and require the insights of many specialties. The faculty and staff of the Department reflect the multidisciplinary nature of the field and include applied mathematicians, chemists, economists, engineers, epidemiologists, physicians, physiologists, physicists, and specialists in occupational health. Students and research fellows come with similarly varied backgrounds.

Degrees

Master of Science in Environmental Health Sciences; Master of Occupational Health; Master of Science in Physiology; Doctor of Science; Master and Doctor of Public Health.

Research

The research programs include topics such as: inhalation toxicology, comparative respiratory physiology, the deposition and clearance of particles in the respiratory tract, and epidemiologic studies of working populations and community populations exposed to various toxic materials; the mechanical properties of lungs and chest wall, development of pulmonary function tests and testing equipment, and application of these methods to the study of respiratory disease in occupational and community environments. Other research studies include: the evaluation of exposures to air contaminants of workers in the railroad industry, meat handling establishments and silicon carbide production facilities; development and application of personal samplers for determining individual and population doses to specific air contami-

nants, including those encountered indoors; development and application of engineering methods for collection of particles and pollutant gases from industrial gas streams; numerical analyses of urban scale atmospheric transport; determination of priorities for air pollution source control; evaluation of mechanisms for the adsorption of radioactive noble gases on activated carbon; analyses of failures of air cleaning systems in nuclear power plants; development of techniques for the control of naturally occurring radon and radon daughter products in homes; and evaluation of countermeasures for protecting the public in case of a nuclear accident.

Programs

Occupational Health

Information concerning programs and degrees in Occupational Medicine and Occupational Safety and Health may be found on p. 69 under Educational Resource Center for Occupational Safety and Health.

Physical Sciences and Engineering

Air Pollution Control

Goals To provide education in the sciences basic to understanding air pollution research and control.

Curriculum Includes courses in community air pollution, health hazards of manufacturing processes, meteorological aspects of air pollution, identification and measurement of air contaminants, aerosol technology, and air and gas cleaning.

Admission Candidates for the program normally have a baccalaureate degree in engineering, chemistry, physics, or biology. Those with a master's degree in a discipline closely related to environmental health and those with a baccalaureate degree plus (1) two years of directly relevant experience, or (2) three or more years of experience related to their expected degree may be able to earn the S.M. degree in one year.

Career Outlook Recent graduates have taken positions with federal, state, or local regulatory agencies, with consulting firms, with industry, or with universities.

Industrial Hygiene

Goals The master's program is designed to meet the demand for professional personnel with the skills and scientific knowledge that are needed to identify and control health stresses associated with the working environment — e.g., air contamination, noise, radiation, heat, pressure, etc.

Curriculum Generally includes recommended and required courses dealing with basic problems in occupational health and industrial environments, policy issues in occupational health, environmental control, identification and measurement of air contaminants, air and gas cleaning, principles of toxicology, human factors in occupational performance and safety, and aerosol technology.

Admission Acceptable candidates for the program normally have a bachelor's degree in engineering, chemistry, physics, or biology. Although this is primarily a two-year program, students with master's degrees in the above disciplines and some students with prior training or experience in related areas may be able to earn the S.M. degree in one year. It is a terminal program for most students, although a few continue toward the Doctor of Science degree.

Career Outlook Recent graduates have taken positions with federal, state, or local regulatory agencies, with consulting firms, with industry, or with universities.

Environmental Health Management

Goals To provide additional education in the environmental specialties and in environmental management and policy analysis.

Curriculum Multidisciplinary program which draws upon courses offered by the Harvard School of Public Health, by other faculties of Harvard University, and by the Massachusetts Institute of Technology. In addition to the basic course in environmental health management, students normally take a series of courses in air pollution control, industrial hygiene, radiological health (specialty areas offered through the Department of Environmental Science and Physiology), or water pollution control (offered through the Division of Applied Sciences of the Graduate School of Arts and Sciences), supplemented by electives in environmental economics, public health administration, political and social sciences, environmental law, environmental planning, and health education.

Admission Students admitted to the program normally hold a bachelor's degree in biology, engineering, geology, or another science. This program is usually two years in length and generally includes a field training assignment with an environmental health agency during the summer. Selected opportunities for continuing toward the doctoral degree are open to qualified recipients of the S.M. degree.

Career Outlook Recent graduates have taken administrative or regulatory positions in environmental health.

Radiological Health (Radiation Protection)

Goals To provide students with knowledge of the fundamentals of radiation protection. Considerable attention is given to the effects of environmental releases of radioactive materials, and the associated requirements for complying with regulations and standards.

Curriculum Includes recommended and required courses covering radiation protection, radiation biology, radiation instrumentation, radiation dosimetry, and aerosol technology.

Admission Students admitted to the program normally have bachelor's or master's degrees in physics, mathematics, or engineering. Two years are normally required to earn the S.M. degree, although some students with prior training and/or experience in relevant areas may earn the degree

in one year. About half the students continue toward the doctoral degree.

Career Outlook

Recent graduates have taken positions with the nuclear power industry, hospitals, universities, research institutions, governmental regulatory agencies, and consulting architectural or engineering firms.

Respiratory Biology

Goals

This program offers doctoral training in preparation for research careers in respiratory biology. It is built on a public health viewpoint of the lung as a portal of entry and a target organ for environmental agents, and focuses on two aspects of organ system physiology: respiratory mechanics and respiratory defense mechanisms. Also emphasized are inhalation toxicology and the pathology of environmental and occupational lung disease. The biology is broadly based, ranging from molecular and cell biology to integrated organismic, environmental, and comparative physiology; both normal and pathological physiology are included.

Curriculum

Intensive course work in the first two years may include physiology, biochemistry, histology, engineering, toxicology, radiation biology, statistics, epidemiology, pathology, and immunology. The latter part of the program consists of research under the guidance of a faculty advisor. Collaborative research opportunities exist in several area institutions. (See p. 23 for specific degree requirements.)

Admission

Intended primarily for students with prior degrees in the physical sciences, or biology with a strong physical science and mathematical component. Two years of residence at the School are generally required to earn the S.M. degree; students with prior master's degrees in related areas may earn the S.M. degree in one year. Terminal master's degree programs are not ordinarily offered; students are expected to continue for the doctoral degree.

Career Outlook

Recent Graduates and Postdoctoral fellows have taken positions in academic, clinical, and government institutions doing basic and applied research and teaching in respiratory physiology and pathophysiology.

Respiratory Epidemiology

This program offers training at both the master's and doctoral level in preparation for research careers in respiratory epidemiology. Major work is directed toward assessing the possible effects of sulfur oxides and particulate matter on health. Other pollutants are also monitored. This has involved adults and children, and airborne material both indoors and outdoors. The research has been planned as a longitudinal study (about to enter its tenth year), so that a considerable data base has been developed both for aerometrics and health data. Health effects are being assessed by standard questionnaires and simple tests of pulmonary function.

Interdisciplinary Programs in Health

Information concerning these programs and postdoctoral fellowships may be found on p. 74.

Some of the courses that the Department offers are described on page 122.

Department of Epidemiology

Brian MacMahon, M.B., Ch.B., D.P.H., Ph.D., S.M. in Hyg., M.D., M.D. (hon.), Henry Pickering Walcott Professor of Epidemiology and Chairman of the Department

Faculty Professors Hutchison, Miettinen, and Monson; Visiting Professor Trichopoulos; Associate Professors Morrison and Rothman; Assistant Professors Gutensohn, A. Walker, and Willett; Lecturers Ellison and Klerman

Teaching and Research Staff Lecturers and Visiting Lecturers Boice, Cole, Feinleib, Finkle, Jick, Paffenbarger, and Sartwell; Research Associates Krolewski and Yen

Introduction The major objective of the Department is to provide opportunities for training and experience in the application of epidemiologic research methods to the investigation of diseases of unknown etiology. Emphasis is on the cardiovascular disorders, the malignant neoplasms, abnormalities of reproduction and development, and other major diseases for which preventive measures are still unknown or inadequate.

Degrees Master and Doctor of Science in Epidemiology; and Doctor of Public Health.

Research Research programs in the Department provide faculty members and graduate students the opportunity to work together exploring the following areas:

— the role of viruses in the etiology of cancer, particularly in relation to Hodgkin's disease
— the evaluation of different radiotherapy regimens for the treatment of Hodgkin's disease
— the relationship between thyroid disease treatment and breast cancer
— an examination of cancer incidence in fluoroscopically examined tuberculosis patients
— the study of mammographic parenchymal patterns and the risk of breast cancer
— the relationship between exposure to chemicals in the workplace and the development of cancer
— a case-control study of laryngeal-hypopharyngeal cancer
— a study of congenital heart disease: examining drugs as a causative factor
— the health effects of oral contraceptives
— the study of the relationship of hormonal patterns and breast cancer
— the role of diet in the development of kidney and bladder cancers
— etiology of non-Hodgkin's lymphoma, with emphasis on immune system disturbances
— epidemiologic methods, with particular regard to significance testing in areas such as proportional mortality ratio and synergism and antagonism

Programs

Goals

The master's program is intended to provide students with basic skills in epidemiologic and quantitative methods and in computing, in preparation for research careers. The doctoral programs are designed for persons who plan careers of research or teaching in epidemiology.

Curriculum

The one-year research training program for the S.M. degree includes most of the courses offered by the Department, plus courses in principles of biostatistics, statistical methods in research, and computing principles and methods (which are offered by the Department of Biostatistics). Additional formal courses in areas of special interest and/or supervised research comprise the remainder of the program. The S.D. program is of four to five years' duration for persons holding baccalaureate degrees; for persons holding relevant doctoral degrees, however, the program is shorter, usually three years in length. Unless course work equivalent to that described above for the S.M. degree has been taken previously, most of the first two years of a doctoral program is occupied with courses. Subsequently, completion of a thesis and experience as a teaching assistant are the principal components. The content of the Dr.P.H. program is identical to that of the S.D. program and will vary in length, usually from two to five years, depending on the individual's background and progress with the thesis component. (Please see p. 21 for more specific degree requirements.)

Residency

A three-year residency in the Department has been approved as satisfying residency requirements of the American Board of Preventive Medicine for certification in General Preventive Medicine. Requirements of the approved residency and of the School's degree programs may be satisfied simultaneously. The residency does not satisfy the one-year clinical component required by the American Board of Preventive Medicine.

Admission

Ordinarily, candidates for the S.M. program are physicians, veterinarians, and dentists. For qualified students the period of research training may be extended by admission to either of the doctoral programs offered by the School, or by admission to special student status. Most of the training beyond the master's degree is occupied in supervised research experience. Potential doctoral candidates must plan at least two years in residence beyond completion of the master's degree.

The Department considers applications for direct admission to doctoral candidacy (S.D. degree) from persons holding baccalaureate degrees with strong backgrounds in biology and mathematics; it also encourages candidates holding other master and doctoral degrees.

The Dr.P.H. program is available to persons holding the M.P.H. degree.

Career Outlook

Some of the positions recent graduates have taken: Officer in Epidemiologic Intelligence Service, Centers for Disease Control; epidemiologists at the National Cancer Institute; and appointments at universities and medical schools in research and instruction.

Some of the courses that the Department offers are described on page 129.

Department of Health Policy and Management

Frederick Mosteller, S.B., S.M., A.M., Ph.D., S.D. (hon.), S.S.D. (hon.), Roger Irving Lee Professor of Mathematical Statistics and Chairman of the Department

Faculty

Professors Curran, Fineberg, Hedley-Whyte, Herzlinger, Roberts, and Rosenkrantz; Visiting Professors Chalmers, Demone, and Gellhorn; Associate Professors Hsiao, Shepard, Stason, Thompson, and Young; Assistant Professors Barrett, J. Brown, Hemenway, Kane, Mariner, Palmer, and Thomas; Lecturers Braun, J.L. Brown, P. Feldman, Henn, Kasten, Segall, Sheldon, Sherman, and Yacovone

Teaching and Research Staff

Lecturers and Visiting Lecturers Allen, Bander, Berarducci, Berwick, Bishoff, Bloem, Blumenthal, Bossert, Burchfield, Bycoff, Caplan, Cohen, Crampton, Cupples, DeFuria, Densen, Douglass, Dumbaugh, Field, Hobart, Hoffman, Holden, Irish, Johnson, Komaroff, Koplan, Landy, Lee, Liang, Lorch, Marra, Montminy, Morris, Moseley, Munier, Nesson, Pyle, Rabkin, Reardon, Rosenberg, Rosenthal, Rozovsky, Sands, Shapiro, Sohl, Taylor, Trevelyan, Wathne, J. Winsten, and M. Winsten; Instructor Marks; Research Associate Saltman

Introduction

The Department of Health Policy and Management is concerned with the allocation and management of resources to deal with public health problems. Such problems may arise in the context of public policy decisions where choices must be made among various programs and policies. Activities must then be designed and implemented, whether the problem area is the health care delivery system, environmental or occupational health, etc. Alternatively, the problem may be set within an individual institution such as a hospital or community health center, or a public health agency where a manager must choose among competing programs and activities. Furthermore, in any setting, effective management is essential if objectives are to be achieved with the limited resources that are available.

The Department includes a two-year master's program in health policy and management, two one-year master's programs in health services administration, and a doctoral program. The Department's faculty is interdisciplinary, including economists, political scientists, physicians, decision analysts, management specialists, and lawyers. Students in any of these programs may choose electives from courses offered at the School of Public Health, by other faculties within the University, or at the Massachusetts Institute of Technology.

Degrees

Master of Science in Health Policy and Management; Master of Science in Health Services Administration; Master of Public Health with a concentration in Health Services Administration; Doctor of Science; and Doctor of Public Health.

Programs

Master of Science in Health Policy and Management

The two-year program in Health Policy and Management is designed to provide a foundation of professional training for managers, policy analysts, planners, and others who intend to devote their careers to working on public health problems. The program has been designed around four key elements: 1) a dual focus on policy and management;

2) an emphasis on both skills and concepts; 3) a grounding in the substance of public health problems; and 4) a curriculum combining academic and clinical activities.

The program is based on the premise that training in an academic setting must be complemented by experience in problem-solving situations. The curriculum is updated regularly and is applied to practical situations by means of a required summer internship program and an applied research program.

Dr. Stephen Thomas is Director of the Graduate Program in Health Policy and Management.

Curriculum

The curriculum for the Health Policy and Management program has been tailored to reinforce the above-described philosophy. There are four important and interrelated elements:

Required Core

A set of required core courses comprises the first year of each student's two-year program. These core courses provide the basic analytic skills and knowledge needed by professionals serving in both policy and management roles in the health field. Subjects covered include: quantitative methods, particularly epidemiology (EPI 201a) and biostatistics (HPM-BIO 219b,c, 219d); essential management skills (HPM 220a,b/220c,d); an introduction to policy analysis, including microeconomics (HPM 100a,b), decision analysis (HPM/BIO 216c), and political and bureaucratic analysis (HPM 250d); and substantive public health issues (HPM 240a). Students may be exempted from those core requirements in which they demonstrate prior proficiency.

Summer Internship

A required summer internship between the first and second years allows students to apply the skills and knowledge gained from the first year, and to acquire further understanding of career possibilities in the health care field.

Flexible Second-Year Curriculum

A flexible second-year curriculum is designed by each student in conjunction with his or her academic and clinical advisors. Maximum flexibility is provided in order to allow students to pursue their own particular areas of interest as fully as possible.

Typically, each student's second-year program of study concentrates on one of two primary skill areas (either policy or management) and in a single substantive health area (such as health services, nutrition, environment, international health, or population). Diverse course offerings allow students to develop expertise in their primary areas of concentration.

Applied Research Program

As part of their second-year activities, students are required to participate in an Applied Research Program. This program includes a research project carried out in conjunction with a local public health organization or agency.

Curriculum Tracks

In addition to the four basic elements described above, the program includes curriculum tracks for physicians and dentists, and for students interested in environmental health. These tracks combine the basic core disciplines of the program with courses directed towards students' specific interests. The Medical/Dental Track contains course work in Clinical Decision Analysis, Principles of Clinical Trials, and others. The Environmental Health Track contains course work in the Principles of Environmental Health and Environmental Health Policy Analysis. All other students automatically would be enrolled in the General Track, which contains course work in Health Care Delivery in the U.S.: History and Sociology and the Health Care Delivery System: Economic and Political Analysis. While remaining in the General Track, students primarily interested in international health may, with the consent of the Program Director, substitute internationally-oriented courses for these two U.S. focused courses. Such courses might include Health Services in Developing Countries, Health Planning in Developing Countries, and Program Implementation in Developing Countries. Applicants interested in these options should so note on their application.

Admission

The program seeks candidates whose academic record, personal characteristics and work experience suggest outstanding potential in the areas of health policy and management. Enrollment is limited to fifty or fewer students per year in order to allow for maximum interaction between students and faculty both inside and outside the classroom. All applicants must demonstrate through course work and aptitude test performance the ability to master the quantitative and analytic content of the program. The program includes academically strong candidates from a wide variety of undergraduate fields. Normally, candidates have at least one year of pertinent post-baccalaureate work experience in the health field, but exemptions are sometimes made for particularly outstanding applicants. (Please see Degree Requirements for Admission, p. 23 and Admissions, p. 81.)

Deferred admissions are available for a limited number of applicants who demonstrate strong potential in the field but who have not had work-related exposure to the health care system. Students who receive deferred admissions status are expected to work within the health system, in a position approved by the program, for a minimum of one year before matriculating. Applicants whose preparation appears deficient in some area, e.g. quantitative methods, may be offered provisional acceptance, contingent upon the successful completion of specific course work in advance of matriculation.

One of the goals of the School of Public Health is to address the health-related problems of the underserved, both in this country and abroad. Accordingly, the program is particularly interested in receiving applications from individuals whose special concerns extend to people in inner cities, rural areas, developing countries, and other locations where such problems exist.

Career Outlook

The program has developed an effective job placement mechanism for its students, utilizing academic and clinical faculty, program alumni, and the resources of the School's counseling office. Additionally, a network of contacts has been developed with potential employers throughout the country and with professionals in a wide variety of executive-level positions who have attended the School's continuing education courses. Examples of positions secured by program graduates include: director of a community hospital; administrative director of a primary care center; director of a certificate of need program; analyst in a state regulatory agency; planner in HHS; director of a state commission on the handicapped; analyst in the Congressional Budget Office; and economist/planner with a health maintenance organization.

Master of Science in Health Services Administration

The one-year Master of Science in Health Services Administration program is designed to address the needs of individuals with advanced degrees in health or health-related fields, including law, who wish to specialize in health services in the areas of health policy, planning, regulation, and/or management. Students are required to concentrate their studies in either policy or management, while at the same time attaining a basic grounding in the general area of health policy and management. Curriculum options are also available for students interested in international health. In exceptional cases, applicants without a prior advanced degree, but with extensive, relevant policy and/or management experience may be eligible for admission.

Curriculum

The curriculum for the Master of Science in Health Services Administration includes a required core for all students, departmental course work in a student's area of concentration chosen from offerings within the Department, and several electives either within or outside the Department. The curriculum totals 40 units or more during one academic year.

A total of 10.0 units comprise the required core:

EPI 201a Principles of Epidemiology (2.5 units)
HPM 240a Toward an Agenda for Public Health (2.5 units)
HPM 300c,d Applied Research Tutorial (5.0 units)

The Department offers four curriculum options, adding course work to the required core: *Policy Option:* add HPM/BIO 219b,c, 219d, HPM 221a,b, HPM 100a,b (or 205a,b), HPM 216c, and HPM 250d; *Management Option:* add HPM/BIO 219b,c, 219d, HPM 220a,b, 220c,d, HPM 205a,b (or 100a,b); *International Option:* add BIO 201a,b, HPM 205a,b (or 100a,b), HPM/POP 262c,d; *Option for Lawyers:* add BIO 201a,b, HPM 221a,b, HPM 257b, HPM 254c, HPM 258d. (See M.P.H. with a concentration in Health Services Administration *Curriculum* for a discussion of the options.)

With the exception of the Applied Research Tutorial, students may be exempted from those requirements in which they demonstrate prior proficiency. The Tutorial consists of the preparation of a written report

in the student's area of concentration, focusing on a topic of interest to both the student and a member of the Department's faculty. The report format may range from a case study to a research paper, and occasionally, depending on the student's interests, may include field work.

Admission

The program seeks candidates who hold graduate professional degrees and have some experience in health services.

Typical applicants to the program would be professionals in public health-related disciplines who expect to devote a substantial portion of time in their careers to health policy and/or management issues; lawyers who are interested in health law, patient's rights, and health planning and regulation; and residents in General Preventive Medicine who are primarily interested in health services and who wish to have an additional year of study in an academic setting beyond the one year required by the American Board of Preventive Medicine.

The program is also designed to satisfy similar needs of health professionals who do not necessarily hold an advanced degree, but who have eight to ten years' work experience in the health services area with a high degree of responsibility, and who wish to undertake course work in their areas of specialization.

All applicants must demonstrate through course work and aptitude test performance the ability to master the quantitative and analytic content of the program. Please see Admissions, p. 81.

Master of Public Health with a concentration in Health Services Administration

The one-year Master of Public Health is a School-wide program designed to prepare professionals for careers in public health practice. Through the core curriculum, the program provides a broad background in various disciplines basic to public health. By concentrating in Health Services Administration, a student commits him/herself to further study of issues in health policy, planning, and/or management. Such students are provided with academic advisors chosen from Department faculty.

Curriculum

Further information on the core curriculum for the School-wide M.P.H program is described on p. 18 of this *Register*.

The Health Policy and Management Department offers four curriculum options designed to supplement the School-wide M.P.H. Program: Policy, Management, International and Lawyers'. In each instance, the Option contains the required M.P.H. core or allowable substitutions, along with some required HP&M courses. Applicants interested in one of these four options should so indicate on their applications and, in their statements of objectives, should describe the nature of their interest in health policy and management. Applicants should also complete the "Statement of Responsibility" portion of the application.

To the School's M.P.H. requirements, the Department's options add (or substitute) the following: *Policy Option:* add HPM 240a, HPM 100a,b (or 205a,b), HPM/BIO 216c, HPM 250d; substitute HPM/BIO 219b,c,

Dr. Steven Thomas, Director of the Graduate Program in Health Policy and Management.

219d for BIO 201a,b; *Management Option:* add HPM 240a, HPM 205a,b (or 100a,b); substitute HPM/BIO 219b,c, 219d for BIO 201a,b, and HPM 220a,b, 220c,d for HPM 221a,b; *International Option:* add HPM 240a, HPM 205a,b (or 100a,b), HPM/POP 262c,d; *Option for Lawyers:* add HPM 240a, HPM 257b, HPM 254c, HPM 258d.

The options for lawyers and students interested in international health offer students a policy or management perspective while allowing the flexibility needed to design an appropriate academic program of study outside the Department.

Students choosing the International Option are expected to take course work on a variety of health issues related to their interests and experience in developing countries. Expecially important will be the electives that stress the application of analytic techniques to program design, implementation and evaluation.

The Option for Lawyers adds a sequence of courses that reviews legal and professional methods of standard setting for medical care programs and loss control. Lawyers with other specialties (e.g., environmental health law) may substitute, with Departmental approval, 7.5 units of other appropriate law and/or policy course work for HPM 254, 257, and 258.

The Policy Option includes course work on decision theory and benefit-cost analysis, and on the implementation of health policies and programs.

The Management Option substitutes the year-long Administrative Systems course for the one-semester Managing Health Delivery Institutions course, focusing on the development of concrete management skills in addition to a broad overview of the field of management.

Further information about these courses, rationales for substitutions and help in choosing between economics courses is available through the HP&M Programs office. Please note that the substitutions of HPM/BIO 219b,c, 219d and HPM 220a,b, 220c,d must be taken in their entirety.

Admission

Applicants must satisfy the requirements for admission to the M.P.H School-wide program as listed on p. 18 of this *Register*. All applicants interested in a concentration in Health Services Administration must demonstrate through course work and aptitude test performance the ability to master the quantitative and analytic content of the program.

Doctor of Science/Doctor of Public Health

The Doctoral Program concentrates on preparing its graduates to perform research at the professional level. More than half the program graduates accept positions as faculty members in universities. Others join state or federal agencies or private research organizations. The degree of Doctor of Public Health is reserved for candidates with prior professional training.

Dr. Frederick Mosteller is Director of the Doctoral Programs.

Curriculum

Required courses cover health care processes and institutions, economics, statistical methods, management, and formal analytic methods. Students select both disciplinary and substantive area majors and minors. Disciplinary areas include economics, management sciences, political science, program evaluation and experimental design, decision sciences, and statistics. Substantive areas include disease prevention and health promotion, health care delivery, health resource allocation — capital and human, and technology assessment. A doctoral seminar is devoted to research methods. Doctoral dissertations comprising original research are advised by committees of three or more faculty members.

Admission

Preference is given to applicants with strong aptitude or competence in a quantitative discipline (demonstrated through course work, work experience and aptitude test performance), experience in the health sector, ability to organize and perform independent projects, and good interpersonal skills. Direct admission to the doctoral program is generally reserved for persons with relevant graduate education. Persons without such education may in exceptional circumstances be directly admitted but will generally be referred to a master's program, from which their doctoral application may be made.

Some of the courses that the Department offers are described on page 131.

Above, Dr. Isabelle Valadian, Professor of Maternal and Child Health and Chairman of the Department of Maternal and Child Health and Aging, with Dr. Omar Hasam Kasule. Below, Dr. Olli Miettinen, Professor of Epidemiology and Biostatistics.

Department of Maternal and Child Health and Aging

Isabelle Valadian, M.D., M.P.H., Professor of Maternal and Child Health and Chairman of the Department

Faculty Professor Curran; Visiting Professor Tanner; Assistant Professors Branch, Deykin, Gardner, Sachs, and Walker; Lecturers Crocker, Dwyer and Hayes; Emeritus Professor Reed

Teaching and Research Staff Lecturers and Visiting Lecturers Gold, Hollinshead, Newberger, Rauh, Ryan, and Stubblefield; Research Associate Butler

Introduction The Department of Maternal and Child Health and Aging is concerned with the human life cycle, factors which affect individuals' life-long health status and the interventions and services needed to promote health.

Degrees Master of Public Health with concentration in Maternal and Child Health; Master of Science in Maternal and Child Health, Doctor of Science and Doctor of Public Health.

Programs

Goals/ Curriculum The major objective of the Department is to provide in-depth understanding of the physical, social, and psychological determinants of health at various stages of the human life cycle and to promote application of this knowledge in health programs. Specifically, the curriculum emphasizes:

1. the developing individual and his or her changing physical, psychological, social, and cognitive strengths from conception to senescence within the context of family and community;
2. the examination of those health, welfare and related services which are currently available and those which could be instituted to meet the health needs of individuals, including those with chronic illness, handicapping or other special conditions;
3. the roles of governmental bodies, health agencies, voluntary and consumer groups in the organization and delivery of health and social services at all levels, e.g., international, national, state and local;
4. the interface of law with health and related systems which has varied implications for service and research at different stages of life;
5. the skills of policy formulation, planning, management and evaluation of MCH programs.

Research The research of the Department involves a broad range of interests. The Longitudinal Studies of Child Health and Development, started in 1930, have been expanded to investigate the patterns of growth, maturation and behavioral, social and nutritional changes in an aging cohort. These data have facilitated the study of variables influencing health status at various stages of life and related adult health to child health and development. Investigation of patterns of physical and behavioral development during childhood and adolescence have particular emphasis on

the development of statistical methods for analyzing processes of growth and development, and the utilization of these methods in health program planning and evaluation.

The interface between health and social well-being is a major concern of the Department. Data from community-wide surveys on the availability and utilization of child health services in western Massachusetts and in an urban Michigan city have been collected and are being analyzed and disseminated. Another study evaluates an intervention program designed to reduce the occurrence of self-destructive or suicidal behavior among adolescents.

Doctoral students' research activities represent a range of interests in areas of health, development, and service delivery. Recent doctoral studies have included topics such as: motor development of children with Downs Syndrome; an intervention program for low-birthweight infants; and obstetric risk assessment.

Research endeavors by department faculty and students include a study of neurological and cognitive sequelae of early infancy apnea; an assessment of developmental intervention of high risk infants, studies on adolescent depression and suicide; a multidisciplinary, intergenerational study of school-aged pregnancy and parenting; and studies of family functioning in families with a child who has a chronic illness.

Admission

Professionals with advanced degrees from health disciplines (including medicine, dentistry, nursing, social work, nutrition, psychology, health education) and other related areas such as law, education and anthropology are eligible for the following degree programs:

The M.P.H. degree with concentration in MCH is a one-year program designed primarily for established health professionals who desire to broaden their knowledge of public health policy and strategies and their specific application to the area of maternal and child health. To be eligible for this degree, applicants must meet eligibility requirements specified by the general M.P.H. program and in addition must have had relevant prior experience in maternal and child health.

Candidates admitted to the M.P.H. program in MCH must fulfill the core curriculum of the M.P.H. program described on page 19 and must take MCH core courses offered by the Department: MCH 200a, 204a,b, 205c,d, 210a, and 220c. It is expected that all students in this program will take courses leading to an understanding of normative physical and cognitive development, of maternal and child health services and of the legislation supporting health and social services in maternal and child health. Students who wish to be excused from specific courses covering this material may petition the Department which will assess the student's proficiency in the area and may grant specific course waivers. Students excused from certain courses will be required to take a minimum of 12.5 credit units in departmental offerings.

The Master of Science degree in Maternal and Child Health (S.M. in MCH) is designed for students who wish to focus in depth on maternal and child health. The department offers both a one-year (40 credits) and a two-year (80 credits) program.

Applicants eligible for the one-year program are established practitioners or researchers with at least a prior master's degree in a related field (medicine, nursing, social work, nutrition, physical therapy, education or anthropology). Applicants to the two-year program are those who have at least a master's degree in an unrelated field (statistics, journalism, law) and who have little relevant experience in maternal and child health. In exceptional circumstances, applicants with a prior baccalaurate degree only may also be accepted in the two-year master's program.

Candidates for the one-year master's program must fulfill at least 20 credit units in departmental offerings whereas candidates for the two-year program must fulfill at least 30 credit units in departmental offerings, including the core courses. At the discretion of the Chairman of the Department, courses offered by other parts of the University may, on occasion, be substituted to fulfill this requirement.

Applicants to the doctoral program in the Department are required to have a prior advanced degree in a health field related to maternal and child health. Such applicants are judged on the basis of past academic performance especially in the quantitative sciences, relevant experience, stated career goals, and interest in an area of research consonant with the goals of the Department and with the expertise of the departmental faculty.

Career Outlook

The master's degree prepares candidates for positions where they will be instrumental in initiating and reshaping public health practice at federal, state, and local levels assuming responsibility for advocating, formulating policies, organizing and administering health care services for women, children, youth and the aged. The doctoral program trains researchers and prepares professionals for academic positions.

A limited number of fellowships may be available to master's candidates who are U.S. citizens and in the area of maternal and child health.

Some of the courses that the Department offers are described on page 137.

Department of Nutrition

Academic Committee
Robert P. Geyer, S.B., S.M., Ph.D., A.M. (hon.), Professor of Nutrition; Peter Goldman, A.B., A.M., M.D., Professor of Health Sciences in Nutrition; and Mohamed el Lozy, M.B., B.Ch., M.D., Ph.D., Associate Professor of Nutrition

Faculty
Professors Antoniades and Lown; Associate Professors Hayes, Herrera-Acena, Thenen, and Verrier; Assistant Professors Franceschi and Owen; Lecturers Austin and Witschi

Emeriti
Professors Hegsted and Stare

Teaching and Research Staff
Visiting Lecturers Gershoff and Samonds; Lecturers Heimendinger, Huber and Nicolosi; Research Associates Ausman, Chu, Gallina, Graboys, Lampert, Lynch, Podrid, Raeder, and Super; Consultants Cannon and McGandy; Assistants Bruno and Gallagher

Introduction
The Department of Nutrition provides training and research opportunities in the basic science and the applied areas of nutrition with orientation towards problems of contemporary public health importance, including cardiovascular disease, obesity, cancer, and diabetes. Other areas of nutrition concerning policy, planning, and applied interventions have been a long-standing interest of the Department, as have health problems related to nutrition in this country and in Central and South America, Africa, and Asia.

Degrees
Master and Doctor of Science; Master and Doctor of Public Health with concentration in Nutrition; Doctor of Science (with Epidemiology).

Research
The research of the Department involves various aspects of nutrition ranging from cell biology and metabolism to animal pathophysiology, clinical studies, and policy planning at domestic or international levels. At the molecular level are studies on the regulation of cell growth by hormonal growth factors obtained from both human blood components and cultured mammalian cells, as well as the synthesis and application of perfluorocarbons for blood replacement. Mechanisms of nutritional interactions with experimental obesity and effects of diet on lipoprotein metabolism, atherogenesis and diabetes are examples of nutritional biochemistry and pathophysiology studies in progress.

Extensive use is made of computers both in the mathematical modeling of growth and in interactive dietary analysis and counseling. Other areas of applied research include evaluation of nutrition programs and dietary methodology.

At the international level are projects concerning the effects of malnutrition on mortality, morbidity and mental and physical development. Research activities of the faculty are listed under the course number "NUT 351-368."

Programs

Goals
The Doctor of Science degree program is designed to train highly qualified individuals interested in laboratory-oriented approaches to solving nutrition and metabolic problems. By utilizing a number of scientific disciplines and engaging in appropriate research, students learn and use the latest techniques in biochemistry, physiology, and related fields.

Dr. Albert Owen, Assistant Professor of Biochemistry.

The research, whether basic or applied, is relevant to human health. A specific doctoral program in Nutritional Biochemistry is available in the department; interested applicants should contact the Department Chairman for detailed information. The joint Doctor of Science degree in the Departments of Nutrition and Epidemiology furnishes thorough training in both of these disciplines, enabling graduates to apply sound epidemiological methods to an ever-increasing number of important nutritional problems. Applicants interested in earning the Doctor of Public Health degree in an area dealing with nutrition should contact the Department for information.

Curriculum

Students accepted to the S.D. program are required to take graduate courses in biochemistry, physiology, epidemiology, and biostatistics and the following Nutrition courses: Principles of Nutrition (NUT 201a,b), Departmental Seminars (NUT 204a,b/204c,d), Biochemistry and Physiology of Nutrition (NUT 205c,d), and Research Techniques in Nutritional Biochemistry (NUT 214a,b/214c,d). In addition, 5.0 units of other formal Nutrition courses are required for graduation. The course requirements for the doctoral program in Nutritional Biochemistry are the same as those given above, but the formal course work also must apply to one minor field in biochemistry and the other chosen from the other basic medical sciences. Research is begun during the first year, and a thesis must be completed within the period prescribed by the School (see p. 26).

The joint S.D. degree with Epidemiology requires the student to take the courses designated for the Doctor of Science programs in the respective departments. In addition to these courses, a minor field must also

be selected that satisfies both departments. A satisfactory thesis dealing with nutrition and epidemiology must be submitted within the time limit set by the School.

Students in the M.P.H. program who concentrate in Nutrition are required to take Principles of Nutrition (NUT 201a,b), Departmental Seminars (NUT 204a,b/204c,d) and at least one other course offered by the Department.

The requirements for the Dr.P.H. degree are the same as those given for the S.D. degree, but the candidate must hold an M.P.H. degree.

Admission

The laboratory-oriented S.D. degree program may be entered at either the master's or the doctoral level. It is highly recommended that the latter route be selected even by students with only a bachelor's degree. The Department may in certain instances exercise its own determination as to which option should apply. An excellent background in chemistry, biology, nutrition, or some other relevant science discipline is necessary for admission. Admission for the joint S.D. degree requires a strong background in biology and mathematics. Approval by both the Departments of Nutrition and Epidemiology is necessary. Applicants interested in this program should contact the Chairman of the Department of Nutrition before formally applying. Applicants for the Doctor of Public Health degree with emphasis in nutrition should communicate with the Department Chairman prior to filing an application.

Career Outlook

Some positions recent graduates have taken: Assistant Professor of Biochemistry at a university; Assistant Professor and Research Associate at schools of medicine; postdoctoral research fellows in medical centers and universities; Nutrition Research Director at a major food company; nutritionist at a school of public health; director of nutrition support service in a medical center; community nutritionist for a state health project; local health clinic administrator; food analytical chemist for industrial firm; nutritionist for federal nutrition evaluation agency; nutrition educator for national Tunisian institute.

Some of the courses that the Department offers are described on page 140.

Department of Population Sciences

David E. Bell, A.B., A.M., LL.D. (hon.), Clarence James Gamble Professor of Population Sciences and International Health and Chairman of the Department

Faculty Professors and Senior Lecturer Alonso, Dyck, Harrington, Levins, Lewontin, Nichols, Salhanick, and Wyon; Associate Professor J. Potter; Assistant Professors Berggren and Larson; Lecturers Frisch and Hareven

Teaching and Research Staff Lecturers and Visiting Lecturers Chen, Guerrero, Lane, McIntosh, and Yerganian; Research Associates Holtrop, Hunt, S. Lewontin, Puccia, Seeley, and Whipple; Consultants Gamble, Goldstein, and C. Thomas

Introduction Acting under the conviction that rapid population growth was thwarting efforts to provide better housing, education, nutrition, health services, and medical care, and that the disparity between rates of population increase and rates of development of human and economic resources is a crucial problem confronting society, the School of Public Health established the Department of Demography and Human Ecology in 1962 (renamed the Department of Population Sciences in 1969) and the Center for Population Studies in 1964. As the view of the role of population change in health and welfare has matured, increasing attention has been given to questions of the broader interrelations among population structure, health and welfare, and social change, in both developing and industrialized countries.

Degrees Master and Doctor of Public Health with concentration in Population Sciences; Master of Science in Population Sciences; and Doctor of Science.

Research Some research activities of the Department are: working toward a better understanding of the biochemical and endocrinologic mechanisms controlling fertility; studying the long-term impact of demographic changes within the United States; examining the interactions of fertility, income distribution and other aspects of socio-economic development; pursuing research applied to aspects of family planning and the interactions of fertility, nutrition and infectious diseases; continuing studies leading to community diagnosis of causes of rates of birth, death and migrations; studying biological aspects of population programs; studies of ethical aspects of population policies and programs; analyzing data collected in field studies in Haiti, including studies of mortality, morbidity, nutrition status, fertility and impact of programs; examining factors that might improve food production; and mathematical and experimental study of human ecosystems.

Programs

Goals There is wide variability among the programs of individual candidates, reflecting the diversity of the students' backgrounds, national origins, previous education, areas of professional concern, and career goals. Given these varied curriculum needs, the overall goals of the program are to develop sophistication in data and information management and evaluation, as well as to provide a broad philosophical perspective on problems and issues in the population field and on related issues of health and health care.

Dr. Rose Frisch, Lecturer on Population Studies.

Curriculum

Faculty affiliated with the Department are specialists in demography, ethics, epidemiology, economics, sociology, ecology, genetics, and medicine. The formal courses and the tutorial instruction of the Department are planned to prepare students for effective participation in population programs as administrators, research workers, or educators. Programs of study are offered in these areas: population, health, and nutrition; the design, management, and evaluation of population programs; the analysis of complex ecological systems; demographic analyses; and reproductive biomedicine. Although the Department offers a very flexible program, approximately half of the S.M. students are from or are primarily interested in health and population problems of underdeveloped countries. (Please refer to p. 22 for specific degree requirements.)

For more information about the field visit to Haiti (see p. 145), please address inquiries to the Department, *Field Studies*, 665 Huntington Avenue, Boston, MA 02115. Telephone (617) 732-1232.

Admission

Students with bachelor's degrees in biological and/or social sciences, or in other population-related fields, are generally expected to spend two years in residence toward the S.M. degree. Students with prior master's or higher degrees, or extensive work experience, generally complete study toward the S.M. degree in one year. Approximately one-fourth of those who complete the S.M. degree enter the doctoral program.

Career Outlook

Some positions recent graduates have taken: director of a university center for population studies; principal statistician; executive secretary of an international committee on applied research in population; president of a medical services consultants group; medical director of a planned parenthood association; director of a medical clinic; a programme officer for U.N. Fund for Population Activities; a UNFPA coordinator; a population intern for USAID; and an associate programme officer in Health and Nutrition for UNICEF.

Some of the courses that the Department offers are described on page 143.

Laboratory of Toxicology

A. H. Tashjian, Jr., M.D., Professor of Toxicology, Professor of Pharmacology, and Director of the Laboratory

Faculty Assistant Professors Eisenstadt, Rice, Samson, Schonbrunn and Toscano; Lecturer Ofner

Research and Teaching Staff Visiting Lecturer Greenlee; Research Associates Gunsalus and Voelkel

Introduction

Toxicology is the study of injurious effects of chemicals. The scope of modern toxicology is broad and depends on the integration of knowledge and techniques from the medical, biological, chemical and physical sciences. The faculty and staff of the Laboratory reflect the multidisciplinary aspects of modern toxicology.

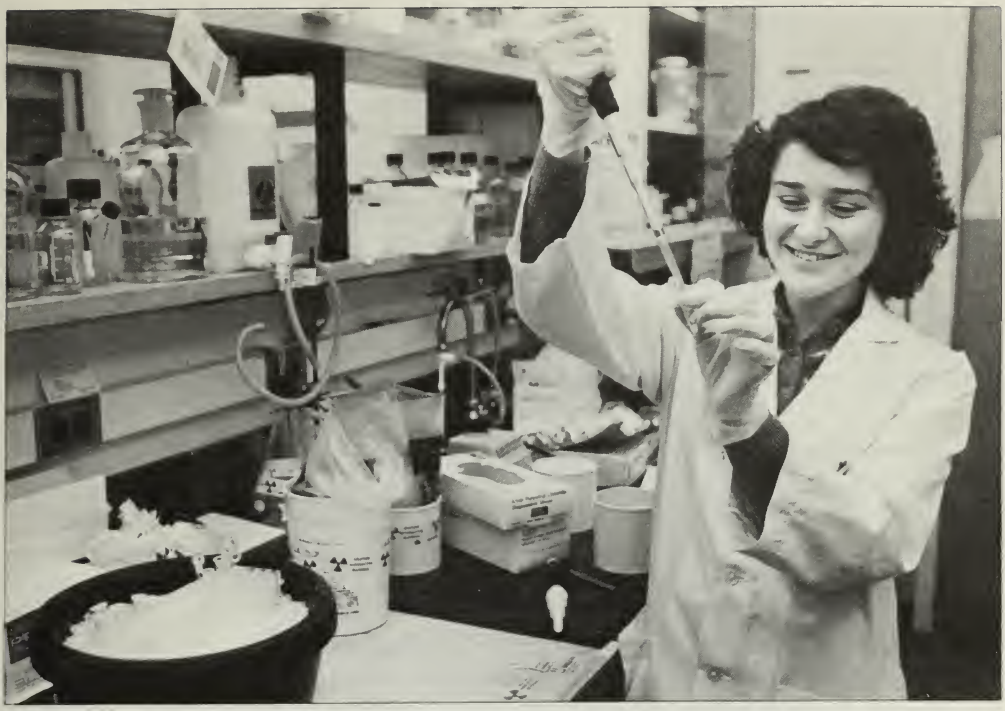
Some of the areas in which the faculty of the Laboratory are conducting research include: receptor mediated toxicity, tumor promotion, site specific mutagenesis, biochemical regulation of cellular toxicity, DNA repair pathways, mechanisms of dioxin action and toxicity, and development and use of animal and human cell culture models.

The research and training program in toxicology provides students with knowledge of the health implications of environmental chemicals, their interactions with a variety of cellular systems, biochemical mechanisms of cellular toxicity, the means to identify toxic environmental chemicals and to prevent or reverse adverse effects where possible.

Students have opportunity to develop their research and teaching skills. Students rotate through three laboratories for eight weeks each. The laboratory rotation experience is under the supervision of each laboratory head and enables the student to become familiar with a variety of laboratory research problems and techniques. At the end of each rotation the student prepares a brief written report and gives an oral presentation. Students are encouraged to participate in weekly faculty-supervised journal clubs and laboratory research meetings. Students who are well into their thesis research are encouraged to present their research at appropriate regional and national scientific meetings.

Degrees

There are two doctoral programs offered: The Doctor of Science in the Faculty of Public Health and the Doctor of Philosophy in Pharmacology (Toxicology) undertaken jointly with the Department of Pharmacology through the Division of Medical Sciences at Harvard Medical School. The degree granted is determined by route of entry; however, the requirement and curriculum are identical.



Galina Wolfson, Research Assistant in the Laboratory.

Curriculum

The first year is usually devoted to course work. Courses are taken at the School of Public Health, within the Division of Medical Sciences, at Harvard University in Cambridge, or at M.I.T. Students are expected to pass a qualifying examination before the end of the third semester. Thesis research for the S.D. or Ph.D. degree should usually be completed in a total of four to five years in residence. The Ph.D. degree is granted by the Faculty of Arts and Sciences; the S.D. degree is granted by the Faculty of Public Health.

Admission

Students should have demonstrated knowledge of organic, physical and biological chemistry, general biology, physics and calculus. There is no language requirement. A personal interview is strongly encouraged. The Graduate Record Examination is required.

Information regarding the program in toxicology may be obtained by writing Professor Armen H. Tashjian, Jr., Director, Laboratory of Toxicology, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115.

Career Outlook

Upon receipt of the doctoral degree, it is expected that most students will take a period of postdoctoral fellowship training prior to entering a career in research in an academic institution, in government service, or in industry.

Some of the courses the Laboratory offers are described on page 146.

Department of Tropical Public Health

John R. David, A.B., M.D., A.M. (hon.), John LaPorte Given Professor of Tropical Public Health and Chairman of the Department

Faculty Professors Chernin, Pan, Spielman, and Weller; Associate Professor Boyer; Assistant Professors Hoff, Jungery, and Wirth; Member of the Faculty Piessens; Lecturer Cash; Visiting Professor Gitler

Teaching and Research Staff Lecturers and Visiting Lecturers Berggren, Buck, Dammin, Fendall, Foege, Hommel, Hopkins, Kaiser, Mata, Miller, Morrow, Moschella, Most, Mott, Neva, Nussenzweig, Pereira, Popenoe, Schrater, Scrimshaw, Sencer, von Lichtenberg, Weisfeld, and P. Weller; Research Associates Cicconi, Piesman, Rossignol, and Todd

Introduction Despite the changing nature of the health problems in the tropical areas of the world, infectious diseases remain of paramount importance. Within the Department of Tropical Public Health, research and teaching efforts center on the ecological and biological aspects of helminthic and protozoal diseases, and on the relevant arthropod and molluscan intermediate hosts. The basic course, Tropical Public Health 201a, is designed to provide students in the Master of Public Health program with knowledge regarding major parasitic diseases and to emphasize their epidemiology and control. Other courses deal selectively with various aspects of parasitism and emphasize the biology, immunology, molecular biology, vector biology, and pathology associated with the organisms. Although ecological, epidemiological, political, and social aspects relevant to the eradication and control of infectious agents are integrated into the teaching programs, the focus of the Department remains primarily on the biological aspects of the host-parasite relationship.

The resolution of the health problems of tropical areas requires a multidisciplinary approach involving a considered appraisal of human resources as well as relevant social, economic, and political factors. The student concentrating in the Department in preparation for a career in the field of international health should seek, in addition to departmental courses, broadened experience in other course work which deals specifically with these aspects of public health.

Degrees Master and Doctor of Public Health with concentration in Tropical Public Health; Master of Science in Tropical Public Health; and Doctor of Science.

Research The investigative program in the Department currently deals with pathogens ranging from viruses to helminths. Studies on cell biology, immunology, molecular biology, and pathology of a wide variety of agents are in progress. Investigation of insect vectors comprise another area of major interest. Facilities are available for the training of a limited number of students at the Doctor of Public Health or Doctor of Science level. The doctoral degree applicant should, if possible, obtain the necessary medical science background prior to enrollment. Collaborative arrangements established with institutions in the tropics provide diversified opportunities for study and research overseas.

Programs

Tropical Public Health

Goals The program has the following goals: (1) to provide students who have adequate training in the health sciences with the additional background essential for careers in research or service in developing countries; (2) to introduce students to the significance, recognition, and prevention of the major infectious disease problems of developing countries; and (3) to introduce them to aspects of human ecology and social development in such areas that influence public health.

Curriculum Students are required to fulfill the distribution requirements for an M.P.H. program (see p. 19) and to take specific specialized courses offered by the Department; the nature of the specialized course work will depend on the interest of the candidate.

Admission The one-year M.P.H. degree program is designed for persons with prior medical degrees (M.D., D.V.M., D.M.D., D.D.S.) or doctoral degrees in biomedical science who are interested in problems of infectious disease in developing countries.

Career Outlook Graduates customarily direct programs dealing with the control of tropical diseases or with research on these entities. Posts are in the public or private sector and at the national and international level.

Medical and Public Health Parasitology

Goals The goals of the program are: (1) to acquaint the student with recent advances in the area of parasitic diseases and with the present status of such diseases throughout the world; (2) to develop skills for evaluation of the current literature and of control programs; and (3) to provide adequate background for conducting research on these diseases, including their biochemical and immunological aspects. The master's program is regarded as preparation for doctoral study.

Curriculum All students must satisfy basic course requirements in biostatistics, epidemiology, and tropical public health. Students usually take advanced course work in one or more of those disciplines, and also elect courses in health services, environmental health sciences, microbiology, and population sciences, etc., according to their interests. Students commonly cross-register for courses in the Harvard Medical School (e.g., immunology, pathology), the Harvard Graduate School of Arts and Sciences, and at M.I.T. Some of the elective work within the Department of Tropical Public Health may take the form of tutorials, laboratory research projects, or both. (See p. 23 for specific degree requirements.)

Admission Students with prior M.D. degrees or doctoral or master's degrees in biological or medical sciences are eligible for admission to this program. The exceptional candidate with a strong biological background but lacking a master's degree will be considered. For the student without prior preparation in pathology, biochemistry, and immunology, two years of course work are customarily required before the S.M. degree is awarded; students with sufficient prior preparation may earn the master's degree in one year. The majority of students go on to earn the S.D. degree and enter careers in research and teaching in the area of medical parasitology.

Career Outlook Graduates are prepared to pursue academic or administrative careers that deal with the important parasitic diseases of man.

Ecology and Control of Vectors of Disease

Goals The specific educational goals of the program are: (1) to acquaint the student with the various arthropod and molluscan vectors of disease and to develop an appreciation of the biology of these organisms and the means for their control; (2) to prepare the student to plan and evaluate control programs; and (3) to develop skills with respect to identification, maintenance, and experimental procedures involving these organisms.

Curriculum In addition to required courses in epidemiology and biostatistics, participants in the program will take courses in vector biology, entomology, malacology, parasitology and microbiology. Depending upon the particular interests of each student, courses in cell biology, invertebrate physiology, pathology, genetics, population ecology and computer sciences may be required. Each participant will conduct a program of original research. (See p. 23 for specific degree requirements.)

Admission Students admitted to this program normally have prior medical degrees or doctorates or master's degrees in biological or medical sciences. Most students take two years to earn the S.M. degree, although some students with previous education in relevant areas may earn the degree in one year. Almost all recipients of the master's degree continue on for the doctorate, in preparation for careers in teaching and research.

Career Outlook The primary goal of this program is to train vector biologists for careers in teaching and research in universities and in governmental and international agencies. Graduates are expected to occupy key positions in programs directed toward investigation and controlling vector-borne disease. International health is emphasized. Thus, graduates of the program may engage in basic biological studies and in operational research.

Some of the courses that the Department offers are described on page 147.

Facing page, Dr. Dade Moeller, Professor of Engineering in Environmental Health and Director of the Office of Continuing Education.

CENTERS, OFFICES AND SPECIAL PROGRAMS

Center for the Analysis of Health Practices

Efforts to promote equity of access or to improve the quality of health care have often had unexpected, and occasionally adverse, effects on the economy, legal institutions, and even on the effectiveness and efficiency of medical care itself. These complex and poorly understood ramifications of choices in the field of health suggest that decisions ought no longer to be considered the province of any single discipline, and that the study of many problems ought not to be left to the chance association of appropriate experts.

The Center for the Analysis of Health Practices (CAHP) represents one of Harvard University's responses to these needs. Based in the School of Public Health, CAHP provides a focus for the research activities of members drawn from the Faculties of Medicine, Government, Law, and Arts and Sciences, and the Departments of Health Policy and Management and Biostatistics of the School of Public Health. Members of the Center include some 25 physicians, economists, policy analysts, statisticians, sociologists, engineers, and systems analysts who are engaged in collaborative research dealing with the application of new technology to health care, medical economics, and the evaluation of medical interventions and primary care. In each of these subject areas, the investigative approach is directed at issues of efficacy, cost-effectiveness and public policy. In order to carry out its research agenda, CAHP has established collaborative relationships with most of the major teaching hospitals affiliated with Harvard Medical School, other providers of health care, insurance companies, and agencies of local, state and federal governments.

The research output of the Center appears in books, monographs, serial publications and discussion papers.

The Center offers a variety of means for students to participate in its activities. Students whose dissertations concern issues in the health sector may wish to use the Center as a resource during the development of their theses. Alternatively, a limited number of students may find opportunities to participate in Center-sponsored research projects during the period of their enrollment in the University.

Students and faculty members who do not have a formal relationship to the Center may remain aware of the research activities of its members by attending the weekly "brown bag" workshops which serve as the major vehicle for communication among the members of the Center and their collaborators. These working seminars provide an opportunity for the discussion of potential projects, methodologic problems, or projects in progress.

Inquiries about programs or activities of the Center should be directed to its staff. The Director is Howard S. Frazier, M.D.; Associate Directors are Peter Braun, M.D. and Herbert Sherman, D.E.E.

Center for Population Studies

The Center for Population Studies was established in 1964 under the leadership of the School of Public Health, as a University-wide Center to join scholars and scientists in different fields in a common approach to human population problems. The members and research associates of the Center are drawn from the Departments of Biology, Economics, Government, and Sociology; the Division of Applied Sciences; and the Schools of Public Health, Design, Education, Government, Medicine, and Divinity. The Center is located at 9 Bow Street, Cambridge.

In the School of Public Health, the Department of Population Sciences welcomes qualified candidates for the various degrees offered by the School. Courses open to all qualified students are also given by members of the Center in other parts of the University.

The present research programs of the Center and the Department focus on several themes: laboratory and clinical research programs in human reproductive biology; economic, social, and environmental determinants and consequences of population change in America and other developed and developing countries, including public health aspects of fertility and the balance between populations and their resources; problems of urbanization and internal migration in both developed and developing countries; theories of population dynamics and their implications for public policy; political and ethical aspects of population policy; and the effect of nutrition and exercise on female reproduction.

The Director of the Center is David E. Bell, A.M., LL.D.

Center for the Prevention of Infectious Diseases

The Center for the Prevention of Infectious Diseases comprises the Departments of Tropical Public Health and Cancer Biology. Working in close collaboration, the staffs of the two Departments are concerned with the broad spectrum of agents that parasitize man and with their relevant arthropod and molluscan vectors.

On a global basis the infectious diseases remain a primary cause of mortality. In the developed areas of the world, morbidity attributable to infectious diseases persists as a major impediment to the enjoyment of health. An increasing number of chronic degenerative diseases are recognized as stemming from the insults of prior infectious processes. In many societies, acceptance of the concept of population control awaits containment of undue mortality induced by the infectious diseases and the consequent assurance that children who are born will have a reasonable prospect of achieving maturity. Considerations such as the foregoing emphasize the continuing need for the public health expert to possess knowledge of the rapidly changing technology of the control of infectious diseases, as well as basic knowledge concerning the attributes and epidemiologic characteristics of the responsible agents.

The faculty of the Center for the Prevention of Infectious Diseases work together to discharge a common responsibility for multidisciplinary instruction in the various facets of diseases of infectious etiology. The formal course offerings of the two Departments are designed and scheduled to permit the acquisition of a broad basic knowledge of infectious diseases as well as an introduction to specialized subject areas. For qualified advanced students, concentration in specific areas with participation in collaborative or individual research is encouraged at both predoctoral and postdoctoral levels. The wide variety of current research projects in the Center permits acquisition of experience both at home and abroad, in the laboratory or in the field.

The Director of the Center is John R. David, M.D.

The Kresge Center for Environmental Health

This Center serves as a focal point for environmental health related research and training activities within the School of Public Health. It includes programs within several departments such as Cancer Biology, Environmental Science and Physiology, and Epidemiology. Full-time faculty within the Center are physicians, engineers, physiologists, mathematicians, toxicologists, chemists, physicists, and other professionals. This diversity enables the staff to deal effectively with environmental and occupational health problems which require a multidisciplinary approach.

Specific categories in which the Center conducts research and training include:

1. Occupational health and safety
2. Air pollution health effects and control
3. Environmental toxicology (inhalation toxicology)
4. Radiation biology
5. Radiological health (radiation protection)
6. Respiratory biology
7. Environmental health engineering
8. Environmental health management

Degree programs include the Master of Public Health, Master of Science, Master of Occupational Health, Doctor of Science, and Doctor of Public Health. Formal requirements for each of these degrees are outlined in other sections of the *Register*. Students interested in any of the above areas ordinarily enroll in the School of Public Health. Students whose primary interest is in problems of water quality and water resources generally enroll in the Division of Applied Sciences of the Graduate School of Arts and Sciences.

The Director of the Kresge Center is John B. Little, M.D.

Educational Resource Center for Occupational Safety & Health

The primary objective of the Educational Resource Center is to train professionals who will be involved in preventing occupational disease and injury. Employment opportunities exist in universities, governmental agencies, industry, and labor unions. Full-time academic programs are offered at the masters and doctoral levels. The multi-disciplinary training is supported by a grant from the National Institute of Occupational Safety and Health. This grant provides financial support to qualified individuals on a competitive basis. College-level inorganic and organic chemistry are required for entrance unless specific exception is made. Applicants presently holding positions in the fields of occupational safety and health who plan to return to those positions are considered particularly strong candidates for admission. For further information about any aspects of the three educational programs listed below, contact Professor Richard R. Monson, Department of Environmental Science and Physiology, 665 Huntington Avenue, Boston, MA 02115. Formal requirements for the degrees are on pp. 18-27.

Occupational Medicine

The residency in occupational medicine is comprised of training in the public health disciplines relevant to the prevention and control of occupational disease and injury. Upon completion of this residency program, physicians are eligible for certification by the American Board of Preventive Medicine (Occupational Medicine). The two-year program includes didactic sessions in epidemiology, biostatistics, industrial hygiene, and health policy, and the practical application of skills to problem solving and research. Field experience includes participation in health hazard evaluations; clinical rotations in which individual patients are evaluated; and the design, execution, and analysis of data for a short-term research project. Residents are placed in occupational health programs in industry, government, or labor unions during the practicum. The residency leads to conferring of the Master of Occupational Health and Master of Science degrees. Applicants must have had one year of clinical training; certification by the American Board of Internal Medicine is recommended.

Industrial Hygiene and Occupational Safety

The two-year master's program in industrial hygiene and occupational safety is designed to help meet the demand for professional personnel with the skills and scientific knowledge needed to identify and control health problems that exist in the workplace. The core curriculum includes recommended and required courses dealing with basic problems in occupational health and industrial environments, environmental control, safety science, identification and measurement of air contaminants, air and gas cleaning, principles of toxicology, biomechanics and work physiology, and aerosol technology.

Students specializing in industrial hygiene normally undertake internships and research projects dealing with toxic substances, noise, radiation, and heat stress. Those specializing in occupational safety normally undertake internships and projects dealing with physical hazards or work methods that cause traumatic or cumulative injury. Students graduating with an emphasis in either area will obtain the skills required to handle the broad range of environmental hazards which exist in the workplace.

Candidates for the programs normally have a baccalaureate degree in engineering, chemistry, physics, or biology. Those with master's degrees in the above disciplines or prior training or experience in related areas may be able to earn the Master of Science degree in one year.

Occupational Safety and Health

Individuals with a baccalaureate degree and with advanced training in social or natural sciences may gain admission to a Master of Science degree program in occupational safety and health. The program can emphasize either the epidemiologic or policy aspects of occupational safety and health. This is generally a two-year degree program, although an individual with a Ph.D. or J.D. degree may complete the program in one year.

Office of Continuing Education

The Office of Continuing Education was established by the School of Public Health in January 1982. This Office is an outgrowth of the Executive Programs in Health Policy and Management and the Program of Continuing Education in Environmental Health. The purposes of the Office are to stimulate continuing education activities throughout the School and to provide leadership in planning new programs and in developing innovative approaches in this field. During the academic year 1983-84, the Office of Continuing Education will coordinate the presentation of approximately 35 courses, ranging from three days to two weeks in length, with the majority covering three to five days. Subject categories covered include Medical Sciences and Management, Occupational Health, Nuclear Safety and Radiation Protection, Environmental Management, the Control of Indoor Environments, and Quantitative Methods in Public Health.

Lectures in the courses are presented by regular faculty members of the School, supplemented by outside experts for the coverage of special topics. Selected courses incorporate the case method, while others include laboratory sessions during which participants can obtain practice in the use of the latest analytical apparatus and portable field measuring instruments. Each course offered under this program qualifies for one (1) Continuing Education Unit for every ten (10) hours of classroom participation. In addition, as an institution accredited by the

Accreditation Council for Continuing Medical Education, the Harvard School of Public Health designates that certain courses meet the criteria for credit toward Category 1 of the Physician's Recognition Award of the American Medical Association. Selected courses have also been additionally reviewed and approved by appropriate environmental health related certification boards.

Participants in the courses include physicians, health care personnel, scientists and engineers. Most of the participants are employed by federal, state and local public health and regulatory agencies, industrial organizations, professional, trade and public interest organizations, legislative committees, research and development laboratories, public utilities, and consultant groups. During the 1982-83 academic year over 800 professional personnel attended courses presented under this program. A partial listing of courses scheduled for presentation during the 1983-84 academic year is shown on p. 111. Additional information can be obtained from the Office of Continuing Education, Harvard School of Public Health (Telephone: 617: 732-1171). The Director of the Office is Dade W. Moeller, Ph.D.

Office of Health Policy Information

The Office of Health Policy Information is a resource center for journalists, government officials and others, designed to facilitate access to the University's wide-ranging resources in health policy analysis and research. It provides a mechanism for synthesizing and communicating available information in a manner that is timely and relevant to the needs of journalists, legislators, academic, corporate and labor leaders, and others involved in the consideration of health policy matters. The chief aim of the Office is to make a true public resource of the wealth of experience and information available within the University.

Current activities include the publication of a series of background reports analyzing health policy issues, a program of Ivan F. Boesky Visiting Fellowships for journalists, and a monthly colloquium series, the Health Policy Forum. The reports are designed to keep key individuals abreast of important developments in health policy research and analysis. The fellowships provide distinguished medical and science reporters with the opportunity to spend six weeks in residence at the School while conducting intensive research. The Forum provides an opportunity for legislators, agency heads, health care providers, and corporate and labor leaders to discuss their views on health and science policy issues with an audience drawn from this state's academic, legal, political, consumer, health professional, corporate, and labor communities.

The Director is Jay A. Winsten, Ph.D.

Office of International Health Programs

The Office of International Health Programs provides advice both to foreign and to American students with interests in international health in the selection of appropriate programs and courses, and coordinates activities within the School that are relevant to international health. The School provides opportunities for preparation for teaching, research, and service in international health, with particular emphasis on problems of health in developing countries. The School does not offer degrees in international health per se, but in the various public health disciplines, adapted to meet the needs of international health students. The central methodologies taught in the School—biostatistics, epidemiology, policy analysis, demographic analysis, management skills, and so on—are logically applicable to health problems in any human population. Teaching them to students from widely varying backgrounds, however, and teaching their application to countries with very different geographic, cultural, and historical circumstances, has required many modifications in curriculum and in course content. Case studies and illustrative materials from less developed countries, for example, are included in readings and class discussions in a number of courses. And some special courses are offered that focus primarily on less developed countries, including courses on parasitic and infectious diseases, on nutrition and maternal and child health in developing countries, and on health services, health planning, and program implementation in developing countries.

The process of adapting the curriculum to the needs of students interested in international health is an ongoing one, and at any time there are inevitably some specialized demands that the School cannot meet. It is important, therefore, that students interested in international health consult with the Office of International Health Programs to be sure they are aware of all the alternatives available and plan the use of their time at Harvard to maximum advantage. In addition to the courses regularly available in the School, special tutorials can sometimes be arranged where the interests of students and faculty members coincide. Moreover, there are relevant courses available in other parts of Harvard University, and in the Massachusetts Institute of Technology. Cross-registration opportunities are available for students interested in medicine, economics, public administration, education, anthropology, government, social relations, and related subject areas appropriate to particular regions of the world. (Students may also cross-register for courses in foreign languages, but may not apply credit for such courses toward degrees being earned at the School.)

Faculty members active in international health programs have had experience in countries in Latin America and the Caribbean, Africa, Asia, and the Middle East. They are drawn from various departments and schools throughout the University, giving international health an interdepartmental and interdisciplinary orientation. Students at the School of Public Health come from more than 40 different countries, and usually represent the whole range of public health disciplines. The exchange of knowledge between students provides an additional dimension to the learning experience.

The School is establishing a new program of research and advanced study, the Takemi Program in International Health, which will commence operation in the fall of 1984.

The Community Health Improvement Program

The Community Health Improvement Program is a community service component of the Harvard School of Public Health which complements academic programs and courses at the institution. The objective of CHIP is to effect improvement in the health of communities by developing, implementing and evaluating innovative, community-based public health strategies in conjunction with community agencies.

Students accepted in the program receive 5 credits per term for a combination of community internships and participation in community health seminars. CHIP addresses four issue areas: 1) environmental and occupational health, 2) housing, 3) nutrition, and 4) primary care for low-income populations.

The service goals of CHIP are fulfilled by students and by CHIP staff who directly assist community agency personnel in problem-solving efforts aimed at improving the equity, efficiency and effectiveness of health service delivery, and improving the utility of policy-relevant information and evaluation techniques.

Finally, CHIP demonstration and research projects are guided by more general needs for new public health knowledge and understanding. These projects are developed by CHIP staff, faculty members associated with CHIP, and by students.

CHIP is currently in its seventh year. J. Larry Brown, Ph.D., is the Executive Director and Principal Investigator.

Interdisciplinary Programs in Health

The primary objectives of Interdisciplinary Programs in Health (IPH) are to enlist scholars from the natural and social sciences in finding new ways to deal with the critical health problems of today's society and to attract and train for health fields young and midcareer people with strong backgrounds in a natural or social science.

IPH is designed to bring to health problems the knowledge, skills, insights and analytic techniques of a variety of disciplines. It is a University-wide program, based at the School of Public Health. Members of the Faculties of Arts and Sciences, the John F. Kennedy School of Government, Law, Medicine and Business participate in IPH.

IPH presently focuses on environmental health with particular emphasis on issues of both science and public policy related to chemicals in the environment.

Over 40,000 chemicals are currently in production and more than 500 additional ones are introduced each year, many of them biologically active. The problems raised by these chemicals provide the principal emphasis of IPH. The studies range from laboratory studies of biochemical effects at the cellular level to risk assessments and policy analyses of the regulatory process. Individual programs reflect the interests and wishes of participants.

Participants leave IPH prepared to work on health problems in federal, state and local governments, in industry and in research and, in some instances, to launch programs at other universities.

It is not a degree-granting program.

The Participants

IPH provides opportunities for:

1. Promising graduates of advanced degree programs in the natural or social sciences seeking preparation for careers in which their talents can be applied to environmental health-related problems, either through fundamental or applied research or through service.
2. Senior scientists and scholars who have made significant contributions in a discipline and now wish to apply their discipline to environmental health-related problems.
3. Individuals from government or industry who have been involved in problems of environmental health and regulation and wish to broaden their background and perspective.

In addition, IPH seeks to create new cooperative links among scholars within Harvard University as they work on problems relating their fields to applied health research.

The program has several components. First, research may be done individually, in collaboration with existing research groups, or with new interdisciplinary teams. Second, seminars and working groups explore particular problems and develop papers and monographs.

Dr. Donald Hornig, second from left, Alfred North Whitehead Professor of Chemistry in Public Health and Director of Interdisciplinary Programs in Health with Fellows Anthony Janetos and Shelley Weinstock. On far right is Rashid Shaikh, Director, Program on Environmental Health and Public Policy.

Third, Fellows and Visitors meet together regularly, joined by members of the Harvard faculty and distinguished guests, to exchange experiences and to discuss important issues related to health.

IPH Fellows

Postdoctoral fellowships are awarded for terms of one or two years, as appropriate, and may be renewable for a third year.

Fellows are chosen from the natural sciences (chemistry, biology, biochemistry, physics and mathematics), the quantitative analytic areas (statistics, operations research, engineering, computer science, etc.) and the social sciences (economics, sociology, public policy, law, management, etc.).

Those selected will devote their initial period to orientation, exploration of opportunities and selection of projects and advisors. Experimental facilities will be made available in the laboratories of existing research groups. It is expected that during the term of a Fellowship a substantial investigation or analysis will be completed.

For further information on admissions requirements, contact:
Dr. Donald F. Hornig, Director.

Visiting Scientists and Scholars

Visitors may be on leave from universities, industry, or public interest organizations. If stipends are required from IPH they will be adjusted to individual circumstances and the availability of other support to the applicant. Applicants should submit a curriculum vitae, a list of publications, a proposal for research or study to be undertaken in IPH and a statement of the relation of IPH to their career objectives.

Public Health for Lawyers

With the dramatic expansion of legal and regulatory issues in health fields, the need for lawyers with formal training in the health sciences and disciplines is a critical one. There is a growing specialty field for lawyers in various applications of health law including hospital and health care law, personal injury and compensation law, environmental health law, occupational health and safety law, child health law, etc. To meet the need, the School of Public Health has organized an interdisciplinary concentration in public health for legally trained students.

Various degree programs are open to applicants with a law degree and an aptitude for public health studies as evidenced by undergraduate training which should have included courses in statistics, biology, psychology, health sciences, and other relevant areas. Most applicants will have been in law practice at least for a few years, preferably in health law areas. Some applicants are more recent law school graduates who show special promise for health law careers.

Lawyers may enter the General Program of the Master of Public Health degree program, or concentrate in particular departments of the School. For example, a special track of courses has been developed for lawyers in the Department of Health Policy and Management. Lawyers have also taken special concentration in Occupational Health, Environmental Health, Maternal and Child Health, and Population Sciences. Greater special concentration can be achieved by taking a Master of Science degree within a department or on a cross-departmental basis. To supplement their studies at the School, lawyer degree candidates may also avail themselves of course offerings at Harvard University's Schools of Law, Medicine, and Government.

Inquiries may be addressed to Professor William J. Curran, 677 Huntington Avenue, Boston, MA 02115.

GENERAL INFORMATION

History of The Harvard School of Public Health

Professional education in public health had been steadily expanding in Harvard University for more than two decades before the actual founding of the School in 1922. Its gradual development was characterized by certain important steps, the first of which was the establishment, in 1909, of the Department of Preventive Medicine and Hygiene in the Medical School — the first such department in the United States. The degree of Doctor of Public Health was first conferred in 1911. In that year a Department of Sanitary Engineering was established in the Graduate School of Engineering. In 1913, the Department of Tropical Medicine and, in 1918, the Division of Industrial Hygiene, with clinical and laboratory facilities, were organized in the Harvard Medical School.

Also in 1913, the Harvard–Massachusetts Institute of Technology School for Health Officers was formed under the joint management of Harvard University and the Massachusetts Institute of Technology. This School operated until the fall of 1922, when it was superseded by the Harvard School of Public Health, made possible by an endowment for this purpose from the Rockefeller Foundation.

In the early years of the School's operation, several of its departments functioned as joint departments with counterparts in the Medical School, sharing facilities, faculty, and budgets. In 1946, the School was separated administratively and financially from the Medical School and became an autonomous unit of Harvard University. It continues to cooperate with the Medical School in teaching and research, and has also developed close associations with other divisions of the University, particularly the Graduate School of Arts and Sciences, the John F. Kennedy School of Government, and the Graduate School of Business Administration.

The School provides graduate education to prepare people for careers in the practice of public health and for academic and research careers in the public health sciences, as well as mid-career education. It offers the degrees of Master and Doctor of Public Health, Master and Doctor of Science, and Master of Occupational Health.

Location and Resources

The main buildings of the School are the Health Sciences Laboratories at 665 Huntington Avenue, and the Sebastian S. Kresge Educational Facilities Building at 677 Huntington Avenue, Boston. These buildings are near the Harvard Medical and Dental Schools; the Countway Library of Medicine; the Children's Hospital Medical Center; the Beth Israel Hospital; the Brigham and Women's Hospital; and other Harvard-affiliated hospitals. The School's Center for Population Studies has an office in Cambridge.

Health Sciences Computing Facility

Computing and data processing resources are available to students through the Health Sciences Computing Facility (HSCF), which is operated by the School of Public Health. A staff of computer programmers and analysts assists researchers and students from all of the Harvard Medical Area institutions in using the computer as a tool for analyzing data, for doing extensive numerical calculations, and for acquiring, maintaining, and processing large data bases.

HSCF is equipped with four computer systems, three of which are used interactively in a time-sharing mode and one which is used in a batch processing mode. Remote batch processing is accomplished by a high-speed telephone link to the ITEL AS/7031 computer at the Harvard Computing Center in Cambridge. Remote interactive computing is provided by telephone links to computers at the Sidney Farber Cancer Institute, the Harvard Computing Center, the Massachusetts Institute of Technology, and Dartmouth College.

HSCF offers computing capability for School programs using a VAX 11/780 and a VAX 11/750, both running under the UNIX operating system, and a PDP 11/70 running under the MUMPS operating system. Over one hundred simultaneous users can be accommodated. Teleprinter and video terminals are located in the School to allow students access to any of these computers. Students also use an IBM 4341 batch processing system which features a number of statistical packages including SAS, SPSS, and BMDP. Languages available at HSCF include Basic, Fortran 77, PL/1, MUMPS, Pascal, and C.

HSCF staff participate in several computing courses given by the Department of Biostatistics. In addition, HSCF offers short courses on specific languages, packages, and specialized medical and health data bases. Students who have had computing experience may enroll in special tutorials (Biostatistics 313a,b,c,d). The Acting Director of HSCF is Dr. Marcello Pagano.

Libraries

The library needs of the School are served principally by the Francis A. Countway Library of Medicine, located at 10 Shattuck Street. The Countway Library combines the resources and services of the Harvard Medical Library and the Boston Medical Library. Among libraries serving medical and health-related schools, it is the largest in the country, with recorded holdings of more than 509,000 volumes and 4,500 periodicals. The Countway Library also has extensive collections of historical materials, dating from the fifteenth century. Its history of medicine department provides modern facilities for the use of these books and other rarities.

All members of the University may borrow from the Harvard College library at Cambridge. Messenger service is provided daily between the college library, various other Harvard University libraries, and the Countway Library. Some departments within the School also maintain their own libraries. The Boston Public Library, libraries of the Massachusetts Institute of Technology, and other libraries of the Boston area add to the total book and periodical resources available to students.

Other Resources

Students at the School may enroll in courses in other faculties and departments of Harvard University, e.g., in the natural sciences, public administration, economics and other social sciences, statistics, and medical sciences. Many graduate courses at the Massachusetts Institute of Technology and the Fletcher School of Law and Diplomacy at Tufts University are also open to students at the School. Students will generally be granted credit for such courses toward degrees being earned at the School of Public Health, with the exception of courses in foreign languages. Credit granted for cross-registered courses may not exceed one-half of the credit units required for the degree in question.

The School maintains a close association with a wide variety of health, medical care, and welfare organizations in Massachusetts and elsewhere. The facilities of hospitals and certain other institutions adjacent to the School are available to qualified students. Other local, national, and international health facilities provide opportunities for observation and special studies, and members of their staffs are available to assist in the School's educational program. The State Laboratory Institute of the Massachusetts Department of Public Health offers opportunities for qualified students to obtain experience in laboratory methods pertinent to public health.

Taking a tour of Countway Library.

Application for Admission

Application forms for admission to all degree programs and for special student status can be obtained from the Admissions Office, Harvard School of Public Health, Room G-4, 677 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1030). Applications for admission are generally accepted for the fall term only because of the sequencing of courses.

Applicants must submit the following for consideration by the Committee on Admissions and Degrees: (1) a completed application form; (2) transcripts of academic records at college, graduate schools and/or professional schools, with official certification of degrees conferred; and (3) letters of recommendation from at least three people who are well acquainted with the applicant's previous academic work and experience. In addition, the Graduate Record Examination must be taken within the last five years by certain applicants, as noted in the *Degree* section at the beginning of this *Register*. Applicants may apply to one degree program and one specialty area only.

An application fee of $30, which is not refundable, must accompany the application in the form of a check drawn on a bank in the United States, a postal money order, or an international money order payable to the Harvard School of Public Health.

In addition to fulfilling the specific requirements for admission to a degree program, applicants must satisfy the Committee on Admissions and Degrees as to their ability to undertake advanced study at a graduate level. The final decision as to the admissibility of an applicant rests with the Committee.

Admitted applicants submit a $100 tuition deposit when confirming admission. This deposit is credited to the fall term bill and is not refunded if the student fails to register.

The School is unable to accept all who are eligible for admission. Therefore, persons who wish to be considered for admission are urged to submit their applications by February 1 but no later than March 1 prior to the academic year in which they wish to enroll.

Admission of a candidate is for a particular year; if enrollment at that time is not possible, reapplication is necessary and will be considered on the same competitive basis as a new application. Exceptions to this must be approved by the Committee on Admissions and Degrees.

As a matter of policy, Harvard School of Public Health does not discriminate among applicants and students in admissions, educational policies, scholarship and loan programs, and athletic and other programs on the basis of race, religion, sex, national origin, color, creed, handicap, age, sexual orientation, marital or parental status, or status as a Vietnam-era or disabled veteran. The School encourages women and members of minority groups to apply for admission. Increasing numbers of students with disabilities are enrolling at Harvard and are

participating in a wide range of programs and activities. Every effort will be made to meet special needs. There are, however, no separate academic programs for either the physically handicapped or for students with learning disabilities; all enrolled students undertake the same program. The Assistant Dean for Student Affairs has been designated to assist handicapped students and employees in adapting to life at the School.

Foreign Students

Language Proficiency

Applicants from countries in which the language of instruction is not English must satisfy the Committee on Admissions and Degrees as to their ability to speak, read, write, and understand the English language competently. Only students who have shown evidence of academic excellence and who can understand rapid, idiomatic English and can speak, write and read English with a high degree of facility should apply for admission. Students should be advised that they may be required to attend ten or more classes each week and to write papers and frequent short examinations. The School requires that all students maintain a minimum grade average of B− (grade point average 2.70) for graduation, and some departments and programs have more restrictive standards. No allowance is made for students whose English is not sufficient for these demands; therefore, any deficiency must be made up before admission. If a student completes all required course work but does not have a grade point average (GPA) of 2.70, the student will not be permitted to receive a degree.

The School requires that foreign applicants obtain a satisfactory score (ordinarily 550 or better) on the Test of English as a Foreign Language (TOEFL). The test is administered four times a year at centers throughout the world. Applicants are advised to take this test as early as possible in the admissions process. Information concerning the test may be obtained by writing to the Test of English as a Foreign Language, Box 899, Princeton, New Jersey 08540. *Applications will not be considered without documentation of English proficiency satisfactory to the School.*

Financial Certification

The School has adopted the following policy regarding foreign nationals who are applying for admission from outside the United States. An applicant whose financial support is not guaranteed by an official U.S. agency or foundation must submit evidence satisfactory to the School that he or she will have sufficient funds available in U.S. currency to pay the expenses for the full period of his or her academic program, and that he or she is permitted to exchange or export these funds. Certification of adequate financial resources must be received by the School before the immigration form needed to obtain a visa to enter the United States can be issued. Foreign students who are wholly supported by personal funds will be required to have adequate funds to cover the cost of tuition in an escrow account in a U.S. bank before the immigration form will be issued.

Foreign nationals admitted to the School and already residing within the United States will also be required to submit satisfactory evidence of sufficient funds to cover their expenses for the full period of their academic program. Such students will not be permitted to register at the School unless they have adequate funds to cover the cost of tuition in an escrow account in a U.S. bank.

An estimate of living expenses in the Boston area may be found in the section entitled "Living Expenses" on p. 100.

Academic Credentials

Before foreign students are permitted to register, the School must receive official sealed transcripts of all academic records presented for admission. Photocopies of original transcripts or diplomas are accepted only if properly notarized by U.S. Consular officials.

Employment

Foreign students admitted to study programs at the School of Public Health who hold M.D. degrees and who will be holding either an F-1 or J-1 visa under the sponsorship of Harvard University will not be permitted to accept any employment for which an M.D. degree is a prerequisite while in this country under the sponsorship of the University.

J-2 work permits are not automatically granted for spouses of students. Spouses should not expect to receive such a permit during the first six months or even a full year after they enter the country.

Hospital Insurance

All nonimmigrant foreign students are required to enroll in the Harvard Blue Cross/Blue Shield student insurance plan. There can be no exceptions to this requirement. More information about the plan is included in the section, "Registration and Tuition."

All inquiries and communications regarding admission should be addressed to the Admissions Office at the address given.

Degree Candidates

Full Time

Credit units are assigned on the basis of the total amount of time required by a course, both in class and outside of class. Twenty credit units constitute a full program for one term, and a student must take a minimum of 40 credits for the year to be certified as full time. A full-time student must take a minimum of 15 credits per term and a minimum of 5 credits per period. A full-time student may register for a maximum of 25 credit units per term, but no more than 40 credit units per year unless permission to take more than this amount is obtained from the Committee on Admissions and Degrees. Any student seeking this permission must submit a CAD petition to the Registrar when he/she files a study card. Full-time students will not be charged additional tuition for credits over 40 per year.

Students in the two-year 80 credit Master of Science program must take a minimum of 40 credits in the first year and a minimum of 35 credits in the second year. Students who take additional credits in the first year may carry over only *five* credits into the second year, i.e., the total 80 credit requirement may be met by taking 45 credits the first year and 35 the second year. Note that 60 credits must be taken ordinally.

Part Time

Students may register as part-time degree candidates with the approval of the Committee on Admissions and Degrees. Ordinarily this requires half-time attendance; however, full-time full tuition requirements for the degree must be met (see tuition and registration guidelines, p. 83). A one-year program may be completed in two academic years, a two-year program in three academic years (one year full time and two years at half time). Students in a two-year program desiring any other credit hour/program arrangements must submit an application to the Committee on Admissions and Degrees for approval. Ten credit units per term constitute a regular program for half-time students. Half-time students may register for a maximum of 12.5 and a minimum of 7.5 credit units per term for a total of 20 credits per year. Credit units over 20 per year will be assessed an additional tuition charge on a per credit unit basis. Students wishing to take more than 20 credits per year must petition the Committee on Admissions and Degrees for approval.

Requirements for Non-degree Status

Courtesy Students

Persons holding Harvard Corporation appointments (of at least half-time teaching faculty) are permitted to enroll in courses at the School with the permission of the instructor and the Registrar. Harvard employees should consult the Personnel Office about the provisions of the Harvard Tuition Assistance Plan. Courtesy students may take a maximum of five credits per term. In courses with restricted enrollment, preference is given to degree candidates. Course fee payment is not refundable and must be paid at the time of or prior to registration.

Special Students

The School may accept a few students who are not degree candidates. Procedures and requirements for the admission of such students are the same as for degree candidates. Admission of special students to courses is subject to availability of space and the permission of the instructor. Candidates should specify on the application form the courses they plan to take. Admission as a special student carries with it no commitment to accept the applicant as a degree candidate and is limited to one academic year. Special students who wish to be admitted to degree candidacy must reapply and will be considered on the same basis as other applicants for admission. Special students are not admitted only to audit courses. Special student status is governed by the same policies that apply to all matriculated students, but those enrolled less than full time are restricted to courses at HSPH.

After admission to degree candidacy, students may petition the Committee on Admissions and Degrees to count toward academic requirements courses taken as a special student or courtesy student (i.e., while in nondegree status). Permission may be granted if the courses fit into the student's academic program. Students must still complete full credit units for the degree. Tuition credit is not given for these courses, and students who are granted such permission must still meet the tuition requirements for the degree. (See p. 96 for tuition guidelines.)

General Information

The Academic Year

The academic year is divided into two terms. In the School of Public Health the fall term begins in mid-September and the spring term begins in late January or early February. Each term is divided into two periods: "a" and "b" in the fall term, and "c" and "d" in the spring term. Between the terms, in January, a week of field work and special projects is called "e" period. The *Academic Calendar* which gives term dates, recess periods, holidays, etc., is printed in the front of this *Register.*

Official Notices

It is important that each student keep informed of all official notices which are posted on the Office of the Registrar bulletin boards located on the G-Level of the Kresge Building.

Registration

Registration ordinarily occurs the week before the Monday on which fall term begins. Registration for new students in the spring term occurs on the Monday when the term begins. Continuing students register in the spring term by filing their study cards by the appropriate deadlines given in the *Academic Calendar*. Late registration may be accomplished (with a late fee of $25) up to the last day to register in a given term as specified in the *Academic Calendar*.

All foreign students who are registering at the School of Public Health must report to the Harvard International Office, Holyoke Center, 1350 Massachusetts Avenue, Cambridge, MA, at the beginning of each academic year or the beginning of the spring term if not registered for the preceding fall term. There they must present their passports and entry permits or other evidence of their immigration status. This requirement applies to all students who hold an F-1 student visa, a J-1 exchange visitor visa, or permanent resident status.

Every student who is a degree candidate is expected to register until the requirements for the degree are fulfilled or until degree candidacy is terminated. Every resident student, whether full time or part time, must register in person at the beginning of each term. Doctoral candidates doing advanced work may petition the Committee on Admissions and Degrees to register with nonresident status. Since nonresident status is ordinarily considered less than half time, students in this category automatically fall into loan repayment and must make special arrangements for continuation of health insurance, as they are not eligible for the regular Harvard plans. Foreign students who wish to study as nonresidents but within the U.S. may petition for full-time status in order to maintain visa requirements.

Each student must file in person a study form and course cards, approximately one and one-half weeks after the first day of classes. In the fall term, new students are given additional time to file. Students who sign up for courses listed jointly at HSPH and other faculties must register for the HSPH course. Before submitting study cards, a student should visit classes and consult with her/his advisor—who must sign the study

card—to decide on a definite program. Students who file late study cards will be charged a late fee of $25.00 per week. Registration is not considered complete until the study card has been accepted by the Registrar's Office. Study cards may not be submitted by persons other than the individual student unless the student has obtained special permission from the Registrar to accept such an arrangement.

Courses may be dropped from the schedule at the discretion of the instructor if less than five students enroll.

Petition to Change Courses

After a study card is filed, all changes in courses, whether within HSPH or by cross-registration, must be made by petition. Official drop/add forms include space to change grading options and are available in the Registrar's Office. A $10 fee is charged for each petition filed regardless of the number of changes on a single petition. Change petitions will be accepted by the Registrar's Office up to 3:00 P.M. on the date of the published deadline. After that date students must submit a formal petition to the Committee on Admissions and Degrees. The charge for this petition is $25.00. Changes cannot operate retroactively.

Cross-Registration

Students may take courses in other faculties of Harvard University, at the Massachusetts Institute of Technology and the Fletcher School of Law and Diplomacy at Tufts University. Students are advised that dates of deadlines for cross-registration and for beginning of classes vary from school to school (MIT, the Business School and Law School begin fall classes at least one week earlier than the School of Public Health), sometimes making it difficult to coordinate registrations. It is important to consider the desirability of cross-registration in light of two factors. First, that some schools pattern the length and activity of their classes much differently than the School of Public Health. At the Business School, for example, classes meet intensively for several hours at a time instead of meeting in several one- or two-hour sessions per week. This may interfere with a student's ability to attend classes at HSPH. Second, commuting time to all but the Medical School may be as long as 45 minutes each way in winter, so that a total commitment of three hours may be required merely to attend a one-hour class. A student should discuss desirability and feasibility of cross-registration with his/her advisor.

Credit granted for cross-registered courses may not exceed one-half of the credit units required for the degree program of the student. Detailed instructions and cross-registration petitions are available at the Registrar's Office. Petitions must be filed early in each term, whether the course is being taken for credit or on an auditing basis. Students should check instruction sheets and the calendar for deadlines. (*Note*: Students should avoid visiting the Registrar's Office in another faculty on the day of that School's initial registration.) HSPH students who drop C-R courses should do so by filing standard drop/add forms in the HSPH Registrar's Office by the deadline published by the appropriate faculty. Drops will not be accepted after such deadlines.

Grades for C-R courses are transferred from other faculties according to their grading systems and not those of HSPH. Individual instructors may not determine grading options for cross-registered students but must conform to their faculty's official regulations. Students who cross-register are bound by the rules and regulations of the respective faculties regarding grades, examination schedules, make-up examinations, and incomplete work. These regulations are often very different from those at HSPH, and students with questions should consult with the Registrar of the faculty involved. Degree candidates are urged to check the examination schedules of cross-registered courses to avoid possible problems of late reporting of grades to HSPH faculty for the degree lists. Some Law School courses, for example, give examinations at so late a date that grade returns are not possible for HSPH degree candidates.

Undergraduate-level courses taken by cross-registration may not be counted toward a degree at HSPH. Credit will not be granted for undergraduate-level courses. Part-time special students at HSPH may not cross-register.

Tutorials

All tutorials receiving degree credit at HSPH must be taken under the supervision of an HSPH faculty member. Any student seeking exception to this ruling must petition the Committee on Admissions and Degrees for approval. Students must obtain permission from their advisors and file tutorial forms giving descriptions of the course content, hours required, and credit to be awarded when they file study cards. Students are expected to complete two hours of work per file study cards. Students are expected to complete a minimum of two hours of work per week throughout the term to receive one unit of credit.

Audited Courses

Courses may be audited at the discretion of an instructor. No credit is given and no audited courses appear on permanent records or transcripts. Some HSPH courses exclude auditors.

Radcliffe Seminars and Harvard Extension School Courses will not receive degree credit at HSPH.

Withdrawal and Leave of Absence

Students wishing to *withdraw* must notify the Registrar and their department in writing and schedule an exit interview with the Director of Financial Aid and the International Students' Office where appropriate.

Students wishing to take a *leave of absence* must file a petition using a form available in the Registrar's Office which is signed by the advisor and department chairman. The Committee on Admissions and Degrees ordinarily grants leaves of absence for a maximum of two terms.

Students planning to petition for a leave of absence or to withdraw should make an appointment with the Assistant Dean for Student Affairs.

Tuition is prorated according to the calendar dates published on page 96. The effective date of a withdrawal will be the date the letter of withdrawal is filed with the Registrar, or a future date, if so requested in the letter by the student. For students granted a leave of absence,

tuition is charged to the end of the tuition period in which the student is granted the leave of absence. The deadlines for leaves and withdrawals from the School without becoming liable for payment of tuition are given in the *Academic Calendar*. A student who fails to register by the last day to register in a term will be automatically withdrawn unless a leave of absence has been approved. Students who withdraw must apply for re-admission. Students who withdraw after the last meeting of a class will be considered registered for the entire course and the grade will be recorded. Blue Cross-Blue Shield health payments may not be prorated but must be paid by the term.

Notification of Grades

Grade reports for the fall term are available in the Registrar's Office at the end of February. Spring grade reports are mailed to permanent addresses at the end of June. No grades are given to students either by telephone or in person until all grade reports are prepared. Students who wish to know their grades immediately after a course ends may leave a stamped, self-addressed postcard with their instructor or hand it in with the bluebook in courses giving final examinations. Students should confirm this arrangement with the instructor.

Transcripts

Official transcripts may be ordered by filling out a form in the Registrar's Office. The first copy is free, subsequent copies are $1.00 each. Students should allow three to five working days for processing transcript orders. Transcripts given directly to students are stamped "Issued to Student," and anyone requesting records should check to be sure other institutions accept transcripts sent by someone other than the Registrar.

If a student leaves the School with outstanding financial obligations to the University, transcripts are sent directly to the student and not to third parties. Such transcripts carry notations "Issued to Student" and "Student's Financial Obligations to the University Have Not Been Met."

Student Addresses

All students must give their local address at registration and must keep the Registrar's Office informed of any changes in their local address.

ID Cards

Students are issued official Harvard University identification cards for use throughout the Cambridge community to gain access to libraries and classroom buildings. Since these cards are often used as general identification for cashing checks, it is essential to take precautions against loss. Replacements may be ordered through application at the Registrar's Office, where temporary IDs are issued. A replacement fee of $10 is charged to a student's term bill. I.D. cards must be returned to the Registrar's Office upon termination of student status.

Summer Study

HSPH has no regular summer course program, but some students elect to do tutorial or research work during the summer recess. A maximum of five credits will be given for degree credit in summer study. Students must file summer registration forms with the Registrar's Office before the end of May in order to receive degree credit for summer work. Tuition for summer courses may not be applied toward tuition requirements for the degree.

Harvard and MIT Summer Schools

Students should consult departmental advisors before enrolling. Departmental approval is required for degree credit and the Committee on Admissions and Degrees considers petitions for degree credit only after final grades are received in the Registrar's Office. Students must request transcripts and file petitions by published deadlines.

All other summer work must have prior approval of both department and the CAD for consideration for degree credit. The deadline for such petitions is May 25. Degree credit is not ordinarily granted for work done at universities other than Harvard and MIT.

The Grading System

The grading system is as follows: Courses on the 100 and 200 level may be taken with ordinal or pass/fail grades. The ordinal system used for 100 and 200 level courses is A,B,C, and F. The grades have the following numerical values: A = 4.0 (Excellent), A− = 3.7, B+ = 3.3 (Good), B = 3.0, B− = 2.70 (Satisfactory), C+ = 2.3, C = 2.0 (Poor), C− = 1.7, F = 0 (Failing). Courses at the 300 level may only be taken pass/fail.

Minimal grade point average requirements and distributional requirements have been instituted for all students entering degree programs in the fall semester of 1979 and thereafter. Semester and cumulative grade point averages will be computed on courses taken on an A,B,C,F basis anywhere at Harvard and M.I.T. Courses taken pass/fail or on grading systems other than A,B,C,F will not be calculated in the grade point average. The minimal standard for satisfactory work will be 2.70; students must have that average or above to qualify for a degree. Individual departments and programs may set more restrictive standards.

Students taking a one-year degree program are required to take a minimum of 30 credits on the A,B,C,F basis and the remainder as the student elects. Students taking degree programs lasting two or more years are required to take a minimum of 60 credits on the A,B,C,F basis and the remainder as the student elects. This requirement will be verified by the Registrar prior to the awarding of any degree. Doctoral students must receive grades of either A or B in courses counted for their major or minor fields.

Exceptions to this policy can be sought by students or faculty by petition to the Committee on Admissions and Degrees. Cross-registered courses taken elsewhere at Harvard can be included in the minimums if they are at the 100 level or above and if taken with an A,B,C,F grading system.

Faculty are encouraged to offer both grading options in all 100 and 200 level courses. However, faculty who wish to offer only one grading option (ordinal or Pass/Fail) may do so but must publish this information in advance of the beginning of the course.

Students have the right to receive grades on the A,B,C,F system, if designated on the study card at the beginning of the period.

When courses are taken on a pass/fail basis, grades A through C– are equated with a Pass. A grade of F has the same value in either the ordinal or the pass/fail system.

Students may normally repeat failed courses for both grade and credit. The grade received when the course was taken the first time remains a permanent part of the record, but only the repeated grade will be used in computing the cumulative grade point average. (See section on *Failure of Required Courses*.)

A grade of incomplete (INC) may be awarded at the discretion of the instructor. Incompletes remain a part of the student's permanent record. Once a grade is received it is added next to the Incomplete, e.g., I/B. An incomplete will be recorded as a failure on a student's permanent record unless the deficiency has been corrected by the end of the next term, on the deadline noted in the *Academic Calendar*. An instructor may require that the student correct the deficiency earlier, in which case the student and the Registrar should be informed in writing of the deadline. Students receiving an incomplete for a course required for graduation will not be awarded a degree until the course work is satisfactorily completed and a passing grade submitted to the Registrar's Office in writing.

Failure of Required Courses

BIO 201ab (or HPM 219b,c,d) and EPI 201a are courses that are required for all Harvard School of Public Health students. ESP 201a,c, 202b, or 203d, HPM 221a,b and a case studies course are required for all MPH students. The CAD has voted the following procedures in the event of failure in one or more of these courses:

1. If a student fails two or more of these courses, no makeup arrangements will be permitted.
2. If a student fails one of these courses *and* is in the first year of a two-year program, the course should be retaken in its entirety.
3. If a student fails one of these courses *and* is in the last (or only) year of a program, a makeup tutorial is permitted at the discretion of the department chairman. The specifics of any makeup tutorial must be approved by the CAD each year. In general, the following procedures apply:
   a. Unless a course is repeated in its entirety, the initial failure will be counted in the student's grade point average.
   b. A makeup tutorial should be graded pass/fail and will receive academic credit. The tutorial need not be for as many credits as the failed course; 2.5 credits is the recommended credit load for the tutorial.
   c. The makeup tutorial should have a final examination.
   d. At the successful completion of the makeup tutorial, the department chairman should certify to the CAD in writing that the student has met minimum departmental requirements for the subject matter of the failed course.

Final Examinations

Final examinations are ordinarily scheduled during the last week of each period. Final examinations must be taken and may not be repeated, except that, with the concurrence of the Assistant Dean for Student Affairs and the Chairman of the Department concerned, a faculty member responsible for a first-quarter fall course ("a" period) will have the option of offering a re-examination to students who have failed the regular final examination. A student who does not attend a final examination in a course will be given a grade of ABS. At the discretion of the Assistant Dean, makeup examinations may be given to students who were absent from the regularly scheduled final exam because of significant medical or personal reasons. In such cases the Assistant Dean should, if possible, be given notice in advance of the beginning of the examination. Unexcused absences remain ungraded, and no credit is given for the course. Incompletes may not be given for unexcused absences from final examinations.

Grade Points

Grade points for a course will be determined by multiplying the number of credit units times the value associated with the grade assigned. The grade point average is defined as the sum of grade points earned divided by the total credit units for which grade points were calculated. Pass/fail credits are not included in computing grade point averages.

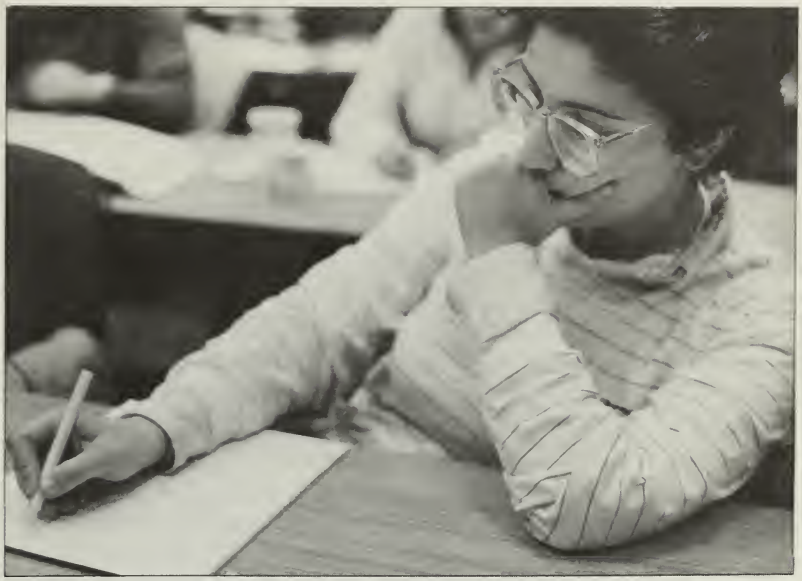
Grade Point Averages

The minimum standard for satisfactory work at the School is a B− average or a grade point average of at least 2.70. In some departments and programs, however, students will be expected to maintain an average above this minimum. Such requirements will be stated in advance. A student whose record is below the standards of the department, may, at the end of a given term, be informed by the Committee on Admissions and Degrees, upon recommendation of the department, that he or she may re-register subject to specific academic conditions which if not fulfilled by the date specified may result in the termination of candidacy.

Alternatives

During registration, each student should mark the box on each course card indicating which grading system—ordinal or pass/fail—is desired. Note that 300-level courses are graded only P/F. In the event of cross-registration, the grading system of the host school must be used for that particular course. Students planning future application to doctoral programs are advised to elect the ordinal system. Doctoral students must elect the ordinal system in all courses offered for their major or minor fields. Students should discuss the advantages and disadvantages of both the ordinal and P/F grading systems with their advisors before selecting an option.

Ordinal grades provide a more definitive record of student performance and are therefore useful in future job and academic applications. An advantage of the P/F system is that students will not be inhibited from taking courses of interest outside their areas of concentration for fear of obtaining poor grades. Also, some students already have advanced professional degrees or job experience which makes taking over the required number of ordinal credits unnecessary for their future plans.



In selecting grading options, students must consider both minimum school distribution requirements and any additional requirements set by their department or program.

Calculation of Credit Units

Credit units are assigned on the basis of the total amount of time required by a course, both in class and outside of class. Twenty credit units constitute a full program for one term. Ordinarily a full-time student may register for no more than 25 credit units per term unless permission is granted by the Committee on Admissions and Degrees before the drop/add deadline. Half-time students may register for no more than 12.5 credits per term. Twenty credit units per year constitute a full-time program for half-time students.

Changes in Grades

Final authority for the designation of grades rests with the principal instructor in each course. Once a grade has been reported in writing to the Registrar's Office, it can only be changed upon written request of the instructor to the Dean for Academic Affairs. This does not apply to changes from INC to appropriate grades for credit. Letters regarding changes must include an explanation as to why the grade is being changed. If the grade is based on clerical error, the Dean for Academic Affairs may authorize the Registrar to change the grade. If it is an error of judgment or because of new information regarding the student's performance, the change will be approved only if also approved by the Committee on Admissions and Degrees. The instructor is ordinarily expected to indicate that he or she has reviewed the work of other students in the course in order to determine that no similar errors have been made and gone uncorrected.

Tuition and Fee Schedule

The tuition and fees for the academic year 1983-84 are listed below:

$7,950*	Full-time resident tuition
4,120*	Half-time resident tuition (up to 20 credit units per year)
4,180*	Doctoral reduced tuition
2,230*	Doctoral half-time reduced tuition (up to 20 credit units per year)
920*	Doctoral facilities fee (resident)
360	Nonresident doctoral guidance fee
40	Active file fee for degree candidates on leave of absence
	Part-time special students enrolled for 6 to 9 credit units per term:
335*	First credit unit of work per term
195	Each additional credit unit
	Part-time special students enrolled for 1 to 5 credit units per term:
195	Charge per credit unit per term
	Degree candidates who register and receive credit for research or supervised study during the 1984 summer session:
975	Five-credit summer program
25	Late Registration Fee
25	Late Study Card Fee plus $25 per week
10	Drop-Add Petition Fee (for each petition filed within published deadlines)
25	Drop-Add Petition Fee (for each petition filed after published deadlines, including CAD petitions)

The starred amounts include the University Health Service fee for medical care for all resident students enrolled for 6 or more credit units. University Health Service coverage extends from September 1 through August 31.

Hospital insurance is billed separately. A Blue Cross/Blue Shield student insurance plan provides coverage for many costs of medical care not offered at the University Health Services. Coverage under this plan extends from September 1 through August 31. The tentative premium for the Blue Cross/Blue Shield student insurance plan is compulsory for all nonimmigrant foreign students; all other students are also enrolled in the plan unless they have other adequate medical insurance and submit a waiver within two weeks following registration. Students who fail to file waivers will be responsible for any fees billed for that term. Waivers for *hospital* insurance are approved only by the Director of the University Health Services.

It should be noted that nonresident doctoral students are not eligible to participate in any Harvard health plan. For continued Blue Cross/Blue Shield coverage, nonresident doctoral students must file special forms with the student insurance office in Holyoke Center by the deadlines published for each term. This insurance is compulsory for all nonimmigrant foreign students in nonresident status within the United States.

Final Doctoral Tuition Fee

For the registration period in which a dissertation is formally approved and accepted by the department and the Committee on Admissions and Degrees, a Doctor of Science or Doctor of Public Health candidate must have paid at least half of the then current facilities fee. The fee for 1983-84 is $230. Students graduating in November or March who wish to maintain health insurance during the final term are required to pay one half the University Health Services fee ($284) and one half the Blue Cross/Blue Shield fee ($290).

Payment of Fees

No student will be permitted to register in any term until all money due from prior term bills and at least one quarter of the commencing term's tuition and fees have been paid in full or satisfactory arrangements have been made either through the School of Public Health's Financial Aid Office, or through the Special Billing Department of the Harvard University term bill office (for students requiring third party billing). Students not enrolled in the extended payment plan must pay the full amount by the dates indicated in order to register. To register for the extended or monthly payment plan (four each term), sign the enrollment card at the term bill office and pay one quarter of the tuition for that semester plus a $25 processing fee per term.

Special students enrolled for less than 10 credits are required to pay all tuition and fees for the term in full when they file study cards. In event of withdrawal, tuition will be prorated according to the schedule below. All other bills for tuition and fees will be issued and payable as follows:

Student term bills for the fall term will be issued on July 23, and will be payable *in full* by August 19.
Bills for the spring term will be issued in early January, and will be payable *in full* by January 20.

Students who are candidates for degrees must have paid all bills to the University at least three days before the day upon which the degrees are to be voted by the Faculty of the School of Public Health.

A student who leaves the University for any reason whatever must pay all charges against him or her immediately upon receipt of a bill from the Office of Fiscal Services. Every student is held responsible for the payment of fees until he or she has notified the Registrar *in writing* of his or her intention to withdraw from the School. A student who fails to submit written notification of withdrawal will be liable for tuition and fees for the term.

A student who leaves the School during the academic year is responsible for tuition charges in accordance with the following:

Leaves by		Percent of Total
First Term	*Second Term*	Semester Charges
October 21	February 24	25%
November 23	March 23	50%
December 23	April 20	75%

Students leaving after December 23 and April 20 of the first and second terms, respectively, are responsible for full tuition charges.

If a student who is receiving any form of financial aid withdraws and is entitled to a refund, a portion of that refund may be returned to the financial aid fund. A special refund rule applies to these funds: National Direct Student Loans, Guaranteed Insured Student Loans, Federally Insured Student Loans. These funds must receive the same proportion of the refund as the proportion which each constituted of the original aid package.

All term bills are sent to the student at his or her local address unless the Office of Fiscal Services is requested in writing to send them elsewhere.

Any student whose indebtedness to the University remains unpaid on the date fixed for payment may be deprived of the privileges of the University. Reinstatement is obtained only by consent of the Dean of the School in which the student is enrolled after payment of all indebtedness and a reinstatement fee of $20. As a further condition of reinstatement, the student may be required to file with the Office of Fiscal Services a bond in the amount of $1,000 as security for the payment of future term bills.

Registration and Tuition Guidelines

The following guidelines for payment of tuition apply as stated to all students who enrolled at the School of Public Health for the first time on or after September 1, 1979. The guidelines also apply to students enrolled at the School before that date, with the exception of certain aspects of the policy concerning payment of tuition by doctoral candidates. Information concerning the applicability of the guidelines to doctoral students enrolled in a degree program at the School during the academic year 1977-78 can be obtained from the Registrar's Office.

Degree Candidates

After admission to the School of Public Health and until fulfillment of requirements for the degree, all degree candidates must be registered continuously in one of the following registration categories:

1. Resident students
2. Nonresident doctoral students
3. Students on leave of absence

All degree candidates must pay the appropriate tuition rate for each registration period as described below; they may not pay tuition on a "per credit" basis. It should be noted that, in order to qualify for defer-

ment of an educational loan, a student must be registered for no less than a half-time study program.

Tuition for summer school courses may not be credited toward any tuition requirements for the degree.

1. *Resident Students*

   All degree candidates who are enrolled in courses or who intend to use any Harvard academic facilities for an extended period of time must register as resident students.

   Students who are registered in a master's degree program in the School will be charged full tuition.

   Students who are registered in a doctoral degree program in the School will be charged full tuition for two years (with up to one year of credit for full tuition paid as a currently enrolled master's degree candidate at the School), followed by one year of reduced tuition. For subsequent terms of enrollment the facilities fee will be charged, which provides for full access to Harvard academic facilities and the University Health Services, and for the issuance of a Harvard resident identification card.

   Part-Time Resident Students

   Any degree candidate who registers for less than full time must in any event fulfill the full-time full tuition requirements for the degree. A master's degree student completing a two-year program in three years must plan to pay at the full-time full tuition rate during the first year and half-time tuition each subsequent year at the rate for that year.

   Full-Time and Part-Time Student Status

   For immigration and loan requirements, financial aid, and degree candidacy, definitions of what constitutes a full-time student are required. A full-time student must take (at least) 20 credits for one term and a minimum of 40 credits for the year. A half-time student may register for no more than 12.5 credits per term. However, there are situations where the above definitions are insufficient to clarify a student's status. Accordingly, the following guidelines will be used:

   a. Students in a one-year (40 credit) degree program and doctoral students.
      1) A full-time student must take *at least:*
         40 credits per year and,
         15 credits per term and,
         5 credits per period
      2) A half-time student may take *no more than*
         25.0 credits per year and,
         12.5 credits per term and,
         7.5 credits per period

b. Students in a two-year (80 credit) degree program
   1) A full-time student must take *at least*:
      80 credits per two years and,
      40 credits in the first year and,
      35 credits in the second year and,
      15 credits per term and,
      5 credits per period
   2) A part-time student in a two-year program must complete the program in three calendar years. The program must be approved by the Committee on Admissions and Degrees (CAD).

c. Students who are in two one-year programs must fulfill each year the requirements for students in a one-year (40 credit) program. Credits may not be carried over from the first program to the second.

d. Persons in a 60 credit master's degree program must follow the guidelines for students in an 80 credit degree program, except that all 60 credits must be taken within three consecutive terms.

e. Students who have received academic credit for work done at HSPH prior to enrollment as a degree candidate must fulfill the same requirements as other students in order to be certified as full time. For example, if five credits have been earned at HSPH for courses taken as a special student or as a Corporation appointee, 40 credits must still be taken during a one-year program to be certified a full-time student.

f. Exceptions to these guidelines are not encouraged. Students requesting an exception must petition the CAD

2. *Nonresident Doctoral Students*

Doctoral students who no longer reside in the Greater Boston area* and who are engaged in less than half-time work on the degree and who have received permission from their department and the Committee on Admissions and Degrees to pursue a portion of their programs as nonresidents will be charged the nonresident doctoral fee. Students in this category normally will have completed payment of at least the required two years of doctoral full tuition and one year of reduced tuition before applying for nonresident status; they must in any case complete this payment prior to their graduation and will be billed accordingly while in nonresident status.

Nonresident doctoral students are charged the nonresident doctoral guidance fee, which covers periodic consultation with the student's doctoral adviser but does not provide for the use of Harvard facilities or for the issuance of a Harvard identification card. Also, as noted above, a student registered for less than a half-time study program may not qualify for deferment of an educational loan. Upon expira-

*Students residing within a 50-mile radius of downtown Boston will normally be considered resident for tuition purposes.

tion (or earlier termination) of CAD permission for nonresident status, or for a term in which use of Harvard facilities is required, the appropriate resident rate will be charged.

3. *Students on Leave of Absence*
   Degree candidates who will not, during a given registration period, be engaged in study or research for a degree from the School, and who will be making no use of Harvard facilities, must apply to the Registrar for a leave of absence. Leaves of absence are ordinarily granted for a maximum of two registration periods and require approval of the student's department and of the CAD.

   Students on leave of absence are required to pay the active file fee to maintain their degree candidacy. Upon expiration (or earlier termination) of CAD permission for leave of absence, students will be charged the appropriate tuition rate.

Termination of Degree Candidacy

Students who do not intend to register in any one of the categories noted above must terminate their candidacy for the degree. Such students are required: (1) to file in the Registrar's Office a written notice of intent to withdraw; (2) to inform their department; and (3) to arrange an exit interview with the Financial Aid Office or the International Office, when appropriate. If students do not terminate their degree candidacy formally but fail to register for a full term or longer, degree candidacy will be terminated automatically. Students who are withdrawn must apply for readmission.

The CAD, with departmental recommendation, may terminate a student's degree candidacy on the basis of unsatisfactory performance in course work. Candidacy also will ordinarily be terminated in the case of a student who has exceeded the five-year limit for completion of degree requirements following registration as a doctoral candidate. Doctoral candidacy may be terminated as a result of failure to submit an acceptable proposal for the thesis. Also, the Administrative Board may recommend termination of candidacy in matters involving academic discipline.

A student who wishes to reactivate degree candidacy should file an application for readmission, which must be approved by the department and by the CAD. Prior to readmission, the student must pay any outstanding bills to the University, as well as the then-current active file fee for each registration period that has elapsed since the termination of candidacy.

Nondegree Candidates

Requirements for admission to nondegree programs are described on p. 84.

Special students registered for full-time or for half-time study programs will pay the corresponding tuition rate; those registered for less than half time will pay tuition on a "per credit" basis as outlined in the tuition and fee schedule.

Field Studies

Field opportunities, listed under each department's course offerings and bearing the course number 330, often entail travel expenses that must be met by the student. Information about estimated expenses should be obtained from the appropriate department.

Living Expenses

Living costs in the Boston area are higher than in most areas from which students come. The following are minimum amounts estimated that students will need in the academic year 1983-1984 to cover expenses for approximately ten months.

A single person will need at least $17,760, in addition to relocation costs, to cover the cost of tuition ($7,950), health insurance ($310), books ($500), rent ($3,400), local travel ($600), and other living expenses ($5,000) for approximately ten months. A family of four will need at least $24,865, in addition to relocation costs, to cover tuition ($7,950), health insurance for student ($310), books ($500), rent ($5,875), local travel ($600), and other living expenses ($9,630), including medical care for spouse and children.

Applicants who plan to enroll in a two-year program should allow for proportionate additional expenses for the summer months and a six to eight percent increase for the academic year 1984-1985.

Housing

The Henry Lee Shattuck International House is an apartment residence operated on a nonprofit basis by the School for its full-time students and their families from the United States and abroad. Located at 199, 203, and 207 Park Drive, within walking distance of the School, the House consists of 72 individual apartments, each with its own kitchenette and bath.

All apartments are rented furnished with basic items except for linens, blankets, and kitchen utensils. No unfurnished units are provided. The monthly rent charge includes all utilities — hot water, heat, gas, and electricity — but not telephone service.

Applications should be submitted by May 15, although late applications will be considered as long as space is available. For application forms and more detailed information, write to Carol O'Connell, Office of Student Affairs, Room G-4, Harvard School of Public Health, 677 Huntington Avenue, Boston, Massachusetts 02115.

The Office of Student Affairs maintains an up-to-date list of private housing and local real estate agencies.

The Harvard University Housing Office in Cambridge arranges for housing in University-owned complexes. Information and application forms may be obtained by writing to the Harvard University Housing Office, 7 Holyoke Street, Cambridge, Massachusetts 02138. A copy of the student's letter of acceptance from the School must be enclosed to prove affiliation. This Office also maintains listings of apartments and houses not owned by the University. These listings must be viewed in person; information is not given out by mail or telephone.

Student Health Service

Under the University Health and Insurance Plan, students at the School of Public Health receive medical care and insurance toward hospital expenses. Medical care is provided through the facilities of the Medical Area Health Service, located in Vanderbilt Hall. The hospitalization insurance extends for a period of 12 months from September 1, and covers hospitalization in Boston and elsewhere. Nondegree, post-doctoral research and teaching fellows who are in a training status are required to enroll in the Student Health Plan unless they can show that they have comparable coverage.

In addition, a prepaid program for spouses (including maternity benefits) and children of full-time students is available. As the plan provides extensive benefits for ambulatory and inpatient care, all who are eligible are strongly advised to enroll. Its coverage, like that of the Student Plan, extends for a period of 12 months from September 1, and provides full semiprivate hospitalization benefits. A descriptive brochure about the plan for dependents is sent to students before registration or may be obtained from the Registrar.

Any illness necessitating absence from classes should be reported to the Medical Area Health Service Office by the student or an attending physician, and to the Registrar's Office at the School. A physician from the Medical Area Health Service, on call twenty-four hours a day, can be reached through the switchboard of Harvard University.

For further information, contact the Director, Medical Area Health Service, 275 Longwood Avenue, Boston, Massachusetts 02115. Telephone: (617) 732-1370.

Loans and Fellowships

The Harvard School of Public Health is a participant in the Harvard University Guaranteed Student Loan program (GSL) and Auxiliary Loan to Aid Students (PLUS). These programs permit a student who is either a U.S. citizen or has immigrant status to borrow up to $5,000 a year under the GSL program, providing the student has less than $20,000 in outstanding loans through this program and up to $3,000 a year through the PLUS program, providing the student passes certain eligibility requirements.

In addition to the above loan programs, a full-time student may borrow through the Health Education Assistance Loan program (HEAL), a federally insured loan program for a graduate student who is either a U.S. Citizen or has immigrant status. Eligible lenders are participating banks.

Some fellowship support is available through departments and special programs from federal and nonfederal sources for qualified students in a variety of fields. In addition, there are limited amounts of funds available under the National Direct Student Loan and College Work Study programs.

If a student who is receiving any form of financial aid withdraws and is entitled to a refund, a portion of that refund may be returned to the financial aid fund. A special refund rule applies to these funds: National Direct Student Loans and Guaranteed Student Loans. These funds must receive the same proportion of the refund as the proportion which each constituted of the original aid package.

As a matter of policy, the Harvard School of Public Health does not discriminate among applicants and students in fellowship and loan programs on the basis of race, religion, sex, national origin, color, creed, handicap, sexual orientation, Vietnam-era or veteran status, marital or parental status, or age.

Detailed information about fellowships and loans can be obtained by writing to Ms. Margaret C. Salmon, Director of Financial Aid, Harvard School of Public Health, 677 Huntington Avenue, Boston, Massachusetts 02115.

Scholarships

The Committee on General Scholarships and the Sheldon Fund administers a number of scholarships which are open to applicants from all Schools of the University. These include Travelling Fellowships, Restricted and Unrestricted Scholarships. Eligibility for many of these funds is very specific and varies according to terms of donors. Nomination for these scholarships must be made by the Director of Financial Aid. For a complete list of University Scholarships, applicants should consult the General Catalogue Issue of Harvard University.

Some awards are made available through departments or the Financial Aid Office and are based on scholastic achievement. One example is the John E. Thayer Scholarship which is the Bequest of John E. Thayer, the income to be paid "to the ten most meritorius scholars in Harvard University every year — the income shall only be paid to such meritorious scholars as who actually need the same." This award is determined by the Committee on Financial Aid following the first semester of each academic year. The award is based on a review of the grade cards of students who have elected the ordinal grading system and a needs analysis based on financial records on file in the Office of Financial Aid.

Office of Student Affairs

The Office of Student Affairs coordinates the activities of the Registrar's Office, the Financial Aid Office, the Office of Career Services, plans student recruitment activities, and acts as liaison with the Alumni Association. The staff works with other groups and individuals to: identify the special needs of students, plan and direct orientation, publish a bi-weekly newsletter, and coordinate social events. Up-to-date information is maintained on housing, child-care facilities, transportation, and athletic outlets in the Medical Area, Boston, and Cambridge.

The Coordinator of Career Services provides career counseling and maintains a resource center containing job listings and files on health care organizations. The Office contacts potential employers to acquaint them with programs at the School and to request information about job openings. Current positions (permanent, summer, and part-time) are posted. Students are assisted in writing resumes, arranging for interviews, and exploring career opportunities. The Office's activities complement the efforts of departments, programs, and faculty advisers. Data collected about positions and salaries of graduates are available to prospective students.

The Assistant Dean for Student Affairs is responsible for assisting handicapped students in adapting to life at the School.

Further information can be obtained from the Assistant Dean for Student Affairs, Harvard School of Public Health, Room G-4, 677 Huntington Avenue, Boston, Massachusetts 02115.

Lockers and Mailboxes

During Orientation the Office of Student Affairs assigns each student a locker with a combination lock, and a mailbox. The lockers are located on the ground, second, and fifth floors of Kresge; the mailboxes are on the G-level of Kresge. Some departments also provide student mailboxes. Announcements about course changes, student events, Student Coordinating Committee business and numerous other items of School concern are distributed through the HSPH mailboxes. In addition, faculty members often send notices to individual students through this internal mailing system. It is important to regularly check mailboxes for these communications.

Typists and Typewriters

HSPH does not have a typing pool for students. Typists seeking work make this known by placing notices on the bulletin boards at HSPH. An electric typewriter is available for student use in the cubical in the S.C.C. lounge area on the G-level in Kresge. Replacement ribbons for this typewriter can be obtained from the Office of Student Affairs.

Bulletin Boards

Many items of interest cannot be distributed individually to each student and are instead announced by postings on appropriate bulletin boards. Accordingly, it is useful to be aware of the variety of bulletin boards and to make a regular practice of scanning them. An important bulletin board to check is outside the Office of Student Affairs—it contains important academic notices from the Dean's and the Registrar's Offices. In addition, many listings from potential employers are listed

on the bulletin board in the G-level area. On the wall approaching the cafeteria on the first floor of Kresge is another set of bulletin boards containing miscellaneous postings by students or persons outside the School. Next to the Kresge elevators on most floors is a bulletin board which announces academic events and public or professional presentations in the Medical Area.

Most departments maintain a bulletin board where relevant material is posted, including job inquiries from employers.

Child Care Facilities

Although there are a number of child care facilities in the area, they are quickly filled, so arrangements should be made as early as possible. Harvard University Child Care is located in Cambridge. For information about the services they provide, including the Medical Area, call the Office of the Child Care Advisor (495-2851).

The Student Affairs Office will be happy to answer any further questions about available child care facilities.

Protection of Rights and Privacy of Students

The School of Public Health has adopted policies and procedures in compliance with the Family Education Rights and Privacy Act of 1974, which is commonly referred to as "the Buckley Amendment." Copies may be obtained from the Registrar's Office, Room G-4, 677 Huntington Avenue.

The Buckley Amendment was designed to protect the privacy of student educational records, afford students and former students the right to inspect the records that directly concern them, and provide students and former students the right to question and challenge the content of their educational records through formal hearings.

General records are compiled by the Admissions Office. These include materials furnished by the student, such as application forms and personal statements, references, transcripts, and other materials from third parties. These files are not available to students until they register at the School. Once a student registers, these folders are transferred to the Registrar's Office, where they are held until the student graduates. Copies of any correspondence with the student are added to these folders. In addition, if a student applies for financial aid, separate records of these transactions are kept in the Financial Aid Office.

Those at the School who have access to student records are the student's academic advisor, the student's department chairman or program head, departmental evaluation committees where appropriate, the Committee on Admissions and Degrees, and the Dean's Office. Students may request to see their records any time after registration by going to the appropriate office and requesting an appointment to inspect the records. Students wishing to discuss or question their records may speak with the Assistant Dean for Student Affairs. If a student wants to change or expunge something from the file, she/he should make a written request and file it with the Assistant Dean for Student Affairs. A committee, comprised of the Assistant Dean for Student Affairs, the Registrar and the Dean for Academic Affairs, will consider the request and

make a decision as to the appropriate action. If the requested change is not granted, the student may place in the file her/his explanation and objection to the information in question.

If a student believes that the School has failed to comply with the provisions of this amendment, or the implementing regulations, he or she may file a complaint with the Department of Education, Washington, D.C.

The following information is considered "Directory Information" and will be released on request without the student's specific written consent: Dates of attendance, program and field in which they are enrolled, full- or part-time status, degrees received, address and phone number (unless the student specifically asks at Registration that these not be released), date and place of birth, degrees received from other institutions, and name of academic advisor. Transcripts of academic work, or grades in any form, will not be released without the student's specific authorization, except to appropriate faculty advisors and committees with responsibility for students' academic progress. Outside organizations or institutions are never given access to student records but are permitted to interview the Registrar regarding the student's record upon presentation of signed consent forms. In such cases, every attempt is made to protect the privacy of the student and to prevent coercion by prospective employers.

Currently enrolled students who are applying for other programs at the School have the right to request that materials in their current student folder not be made available to the admissions committees considering applications.

Disciplinary Procedures for Students

Incidents of improper conduct by a student shall be reported at once to the Assistant Dean for Student Affairs. After investigation, the Assistant Dean will either resolve the issue informally, in consultation with the parties involved, or refer the matter to the Administrative Board.

The Administrative Board, after receiving a formal charge and report from the Assistant Dean, will convene to consider the case. They may call witnesses and review all evidence they deem relevant. The student involved may provide witnesses and other relevant evidence. The student may be present during the presentation of all evidence against her or him.

The Administrative Board must render a decision within a reasonable period of time, and may impose penalties ranging from Suspension to Probation. Expulsion requires a vote by the full faculty. The Board's actions shall be separate from the responsibility of instructors to evaluate the academic performance of students.

Following the Administrative Board's decision, the student may appeal to the Dean of the Faculty for a review of the procedure. The Dean may reverse the decision only if there has been unfairness in the procedure, or misconduct by the Board. The Dean will not reconsider the appropriateness of the finding or the penalty.

Student Conduct

Students are expected to respect the rights of the other members of the Harvard School of Public Health community and to maintain high standards of ethical conduct and personal integrity. A student is expected to do her or his own work, and incidents of intellectual dishonesty will result in disciplinary action. A student may not submit the same paper in more than one course without the prior written permission of the instructors involved.

Students are expected to abide by all city, state and federal laws, as well as University regulations, and infractions of the same may result in disciplinary action by the School.

Grievance Procedures for Students

For both legal and policy reasons, it is desirable that students at the School of Public Health have an established and approved mechanism by which serious grievances may be promptly and equitably resolved.

The following procedures are to be used by students for the resolution of grievances alleging unfair action on the part of the University Administration or Faculty including discrimination on the basis of race, color, religious belief, sex (including sexual harassment), national or ethnic origin, handicap, or age.

The Informal Resolution of Grievances

A student with a grievance should initially take the matter to one of the following people: his or her advisor, department chairman, Dean of the School, Dean for Academic Affairs, Dean for Student Affairs, Affirmative Action Officer, or other appropriate faculty member or administrator. If the grievance cannot be resolved satisfactorily between the student and the initial faculty/administration contact, the student may, at his or her discretion, seek resolution via the formal procedure outlined in Section II. The person investigating the grievance shall, at the request of the student, make a written report available to the *ad hoc* grievance committee in the event that resolution is not possible in the informal phase.

The Formal Grievance Procedure

An aggrieved student, may at his or her request, seek resolution of the grievance via the formal procedures outlined below.

1. A formal grievance is a complaint in writing from the student to the Dean for Student Affairs (in the event that the grievance is against the Dean for Student Affairs, the written complaint shall go directly to the Dean of the School) asking that an *ad hoc* grievance committee be appointed. The written complaint should be filed within two months of the event to which it refers and should include the following:
   a. Statement of the allegation;
   b. Description of the alleged facts;
   c. Name or names of the person(s) thought to be responsible for the alleged events; and
   d. Other facts considered to be pertinent to the case.
2. The Dean for Student Affairs will then appoint an *ad hoc* grievance committee consisting of a representative of the Faculty Council, a

member of the School's Administration, and a student, chosen by the Student Coordinating Committee, who has completed at least one semester at the School. This *ad hoc* grievance committee will be appointed and convened within ten (10) working days of receipt by the Dean for Student Affairs of the written complaint; in all cases confidentiality shall be maintained during the selection and appointment process. A quorum will require that all members be present. The Dean for Student Affairs will appoint the chairperson of the committee.

3. The *ad hoc* grievance committee shall investigate the grievance. This investigation shall include, but need not be limited to, the following:
   a. Meeting(s) with the person aggrieved and the person(s) (or department) grieved against; and
   b. Consultation with such others as the *ad hoc* grievance committee shall deem necessary to provide a thorough investigation of the grievance, including scientific ramifications or concerns, and other mitigating or extenuating circumstances that bear upon the situation.

4. The *ad hoc* grievance committee shall expeditiously consider the facts of the case and present a report to the Dean of the School. The report shall include findings of facts and recommendations, if any. Every precaution shall be taken to ensure the confidentiality of information obtained at meetings of the *ad hoc* grievance committee. The Committee shall also make every effort to conclude the investigation quickly enough to prevent the situation from becoming irreversible and to take any needed remedial action.

5. Upon receipt of the report from the *ad hoc* grievance committee, the Dean of the School may do one of the following:
   a. Take whatever action, if any, he feels is warranted, using the report of the *ad hoc* grievance committee as advisory information; or
   b. Return the matter to the *ad hoc* grievance committee for further consideration. This action will return the grievance to Step 3 of this procedure.

6. The final action of the Dean of the School constitutes the formal completion of the grievance procedure. The *ad hoc* grievance committee will then be discharged. Final action of the Dean of the School will be communicated to both the person aggrieved and the person(s) (or department) grieved against. Once the procedure is completed, all records of the meetings of the *ad hoc* grievance committee and the final report of the committee will remain in the possession of the Dean and will be held in strict confidence.

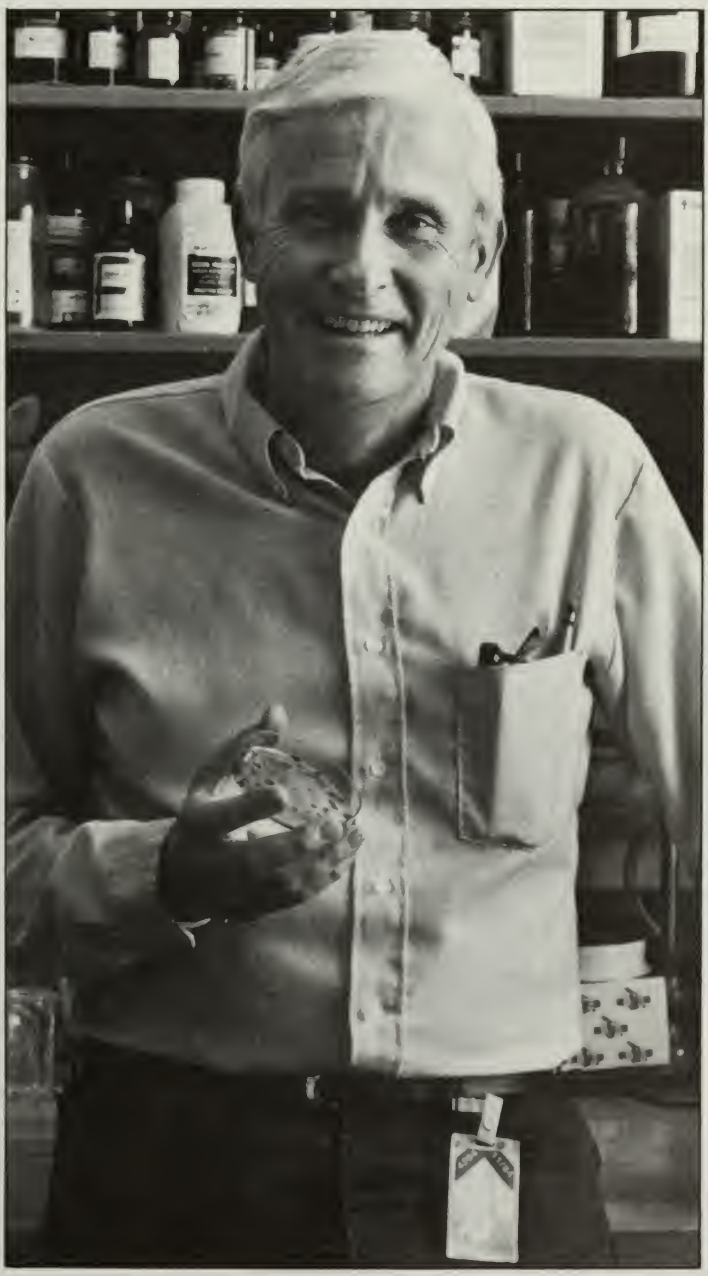
7. Any request for exceptions to the foregoing should be addressed to the Dean for Student Affairs. By mutual agreement of the Dean for Student Affairs and the student, the stated formal procedure may be waived in favor of a procedure more appropriate to a particular circumstance.

Alumni Association

The School's Alumni Association has a membership of approximately 3,800 graduates located throughout the world. The Association is governed by an elected Council which meets twice a year, once in the fall at the APHA annual meeting, and once in the spring at the School. In 1977 the Association initiated the Margaret Dale Penrose Scholarship Fund which has since been permanently endowed with gifts from Alumni and friends and a matching amount from the School. In 1981 the Association was instrumental in the establishment of an Alumni Fund for Student Assistance to which alumni contribute annually. For information about alumni activities, contact the Assistant Dean for Student Affairs and Alumni Relations.

Facing page, Dr. John Little, Professor of Radiobiology.

COURSES OF INSTRUCTION



In the course listings, course numbers from 100 to 199 indicate undergraduate and graduate courses; numbers from 200 to 299 indicate primarily graduate courses; and numbers from 300 to 399 indicate graduate courses of reading and research.

The letters "a," "b," "c," "d," and "e" following the course number indicate the period(s) in which a course is given, with "a" denoting first period and "b", second period (fall); "c", third period and "d", fourth period (spring). The letter "e" indicates supervised special studies or field observations, usually during the one-week period between fall and spring terms or during the post-class period following the spring term.

The credit assignment is given in units following the statement of number and length of sessions per week. Course titles in bold type are often followed by titles and numbers in roman face (enclosed in parentheses). This indicates that the course is also listed in other Harvard catalogs, namely, Arts and Sciences, and that the course credit is provided through that faculty as well as through the School of Public Health, e.g., MCH-BEH 237c,d (Education, P-220) or POP 209a,b (Biology 195).

The School reserves the right to make changes in the regulations and courses announced in this *Register*.

Dr. Barbara Beck, Research Associate in Physiology, left, and Dr. Joseph Brain, Professor of Physiology.

Through its Office of Continuing Education, the School of Public Health offers a variety of short-term technical courses for professional public health personnel. Courses currently confirmed for presentation during the 1983-84 academic year are listed below. Additional information can be obtained from the Office of Continuing Education, Harvard School of Public Health (Telephone: 617: 732-1171).

Environmental Management

Environmental Radiation Surveillance
July 11-15, 1983
Hazardous Waste Management
July 11-15, 1983

Quantitative Methods

Statistical Planning & Analysis of Clinical Trials
July 20-22, 1983
Occupational Epidemiology
July 25-29, 1983
Application of Personal Computers in Solving Public Health Problems
August 29-September 2, 1983

Control of Indoor Environments

Nuclear Power Plant Control Room Habitability
July 25-29, 1983
Clean Room Technology
August 16-18, 1983
Indoor Environments: Health and Comfort Risks
September 22-24, 1983
Design & Maintenance of Laboratory Ventilation Systems
October 25-27, 1983

Medical Sciences and Management

Diagnostic Parasitology in the Medical Laboratory: Intestinal Parasites and Tissue Parasites
July 18-22, 1983
Statistical Planning & Analysis of Clinical Trials
July 20-22, 1983
Occupational Epidemiology
July 25-29, 1983
Application of Personal Computers in Solving Public Health Problems
August 29-September 2, 1983
Certification Review for Occupational Health Nurses
September 26-30, 1983
Program for Chiefs of Clinical Services
October 2-14, 1983
Biological Effects of Ionizing Radiation
1984

Occupational Health

Critical Review of the Scientific Basis for Occupational Standards
July 11-15, 1983
Workers' Compensation, Tort Liability & Occupational Disease
July 18-20, 1983
Occupational Epidemiology
July 25-29, 1983
Certification of Biological Safety Cabinets
August 8-13, 1983
Recent Developments in Ergonomics
August 16-18, 1983
Laboratory Safety & Occupational Health
August 30-September 1, 1983
Current Topics in Industrial Hygiene
September 13-15, 1983
Certification Review for Occupational Health Nurses
September 26-30, 1983
Fundamentals of Industrial Hygiene
October 17-21, 1983
March 26-30, 1984
Design & Maintenance of Laboratory Ventilation Systems
October 25-27, 1983

Nuclear Safety and Radiation Protection

Environmental Radiation Surveillance
July 11-15, 1983
Nuclear Power Plant Control Room Habitability
July 25-29, 1983
In-Place Filter Testing Workshop
August 22-26, 1983
June 11-15, 1984
Occupational & Environmental Radiation Protection
August 22-26, 1983
March 26-30, 1984
Control of Occupational Exposures in Nuclear Power Plants
May 14-18, 1984
Biological Effects of Ionizing Radiation
1984
Planning for Nuclear Emergencies
June 11-15, 1984

ID 104a. Introduction to Selected Medical Problems for Non-Physicians
Lectures. *One 2-hour session each week. 1.25 units.* Members of the Faculty.
Provides students who have limited backgrounds in biology and medicine with a familiarity of medical terminology, some knowledge of the pathophysiology of human disease and diagnostic methodology, and information about the types of therapeutic regimens in current use. The symptoms which bring patients to health care providers will be described, and approaches to diagnoses and treatment will be presented.
Required for students in the two-year Health Policy and Management Program General Track.

ID 201a,b. Historical Analysis of Public Health Policy and Practice: United States, 1900-1975
Not offered 1983-84.
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Rosenkrantz.
Identifies six issues to illustrate the relationship between social experience and professional responsibility for prevention of disease. Topics selected for analysis based on historical example illustrate policy-related issues: how health hazards are identified; determinants of resources; criteria of efficacy and equity in policy and services. Recommended for students who wish to relate their special competence to the network of objectives in public health.

ID 209a. Health Services in Developing Countries
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Cash, Dr. Koch-Weser.
Provides a broad overview of health and health care problems in developing countries. Central issues include: ecologic, environmental, and other characteristics of developing countries affecting health; analysis of their health problems, the alternative approaches to solving them, the policy and planning issues in applying solutions, and the organizational alternatives for utilizing health resources; the nature, composition, and training of the health team for use at the local and district levels; and the relation of health to development and the position of health in national planning priorities.
Preference given to students who have previously been involved in international health activities.

ID 212c. Biomedical Writing
Seminars. *One 2-hour session each week. 2 units.* Dr. Chernin.
Writing scientific papers is an integral part of the research process. This course develops practical skills and experience in planning and writing articles that meet the editorial demands of biomedical journals. The salient elements of a well-prepared article — logical organization, clear and concise scientific prose, and understandable tables and figures — are emphasized by criticizing short papers written by the participants on biomedical subjects of their own choice.
Enrollment limited to 10 students and requires approval of the instructor at least two weeks before the quarter begins. This course will be given pass/fail.

ID 216c. Health Aspects of Nuclear War
Please check with Registrar's Office during "b" period for more information.

ID 217c,d. Capitalism, Socialism, and Public Health
Not offered 1983-84.
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Lewontin, Dr. Levins, Visiting Lecturers.
General course contrasting the analysis of problems in public health, nutrition, and population by Marxist and capitalistic social and economic theories. Topics include: Marxist economics and social theory, population control, "green revolution," nutrition planning, maternal and child health, and occupational health.

ID 220c,d. A Case Study in Integrated Planning
(Economics 2730, Education A-885)
Lectures, seminars. *Two 2-hour sessions each week. 5 units.* Dr. David Cole, Lecturer on Economics, Harvard Institute for International Development, Dr. John Thomas, Institute Fellow, Harvard Institute for International Development.
This seminar brings together students and faculty from the Graduate Schools of Public Health, Design, Education, Arts and Sciences (Economics), and from the Harvard Institute for International Development, to write a development plan for a specific geopolitical area of a developing country. This development planning problem is derived from an ongoing HIID project and emphasizes an inter-disciplinary team approach to problem solving and planning.
Enrollment subject to approval of the instructor.

ID 221c. Case Studies in Decision Making in the Control of Diseases of Public Health Importance
Lectures, team meetings. *Two 2-hour sessions each week. 2.5 units.* Dr. Nichols, Guest Lecturers.
Cases drawn from domestic and Third World sources are studied from the standpoint of decision makers in the control of diseases of public health importance. Students in teams will propose solutions to problems after utilizing information drawn from a spectrum of sources including: molecular biology, host-parasite interactions, epidemiology, management of resource allocations, cultural and socioeconomical constraints. Using a fictitious country as a case study, students are taught practical skills relevant to LDC's; these include problems in pharmaceutical supply, distribution and finance.
Enrollment limited to 50 and subject to approval of the instructor. No auditors. Ordinal grades only.

ID 225c. A Case Study in Urban and Industrial Health Planning in a Developing Country
Lectures, small seminars, workshops. *Two 2-hour sessions each week. 4 units.* Dr. Nichols.
Curative and preventive medicine requirements for a large industrial project and surrounding city are studied together with essential public health support services. Planning includes: definition of the problem; description of health hazards and load on the health services; alternate solutions; enabling and functional linkages required; functional programming including proximity matrices, facilities, staffing, operational support, management and administration requirements, costing and implementation.
Enrollment limited to 40 and subject to approval of the instructor. No auditors. Ordinal grades only.

ID 230c. Health of Community Populations
May not be offered 1983-84.
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Members of the Faculty.
Principally targeted for non-physicians with interests in biostatistics, epidemiology, health policy and management. Briefly introduces history of public health and concepts of health, then focuses on the common diseases particularly affecting persons living in poverty or near poverty conditions in urban America. Presents clinical characteristics of specific illnesses, impact of socio-economic, cultural and environmental factors of ill health. Current preventive medicine measures for specific disease entities will be evaluated.
Prereq. ID 104a or equivalent.

ID 231a,b. Community Diagnosis
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. J. L. Brown.
Introduces the concept of the community as "patient" or "client" to be served by health professionals. Provides students with an alternative broad framework from which to analyze communities and their residents as well as how to introduce sources of health-related information on a community basis. Prepares students to apply analytical tools and methods to community populations.
Prereq. Present or past clinical/field experience.

ID 232c,d. Change Strategies at the Community Level
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Brown.
Assists students in analyzing and understanding functional aspects of communities, and in understanding the role of various institutions with respect to health, illness and the quality of life in communities. Analyzes variables which contribute to success or failure in altering health conditions, and the roles which health professionals play in altering the health status of populations.
Prereq. Present or past clinical/field experience.

ID 330e. Field Trip
Three-day period between c and d terms. 1 unit. Dr. Nichols.
Centers for Disease Control, Atlanta, Georgia.
The Centers for Disease Control (CDC) is a unique institution with many public health functions relevant to the educational and research interests of domestic and foreign students.
This field trip will give students an overview of the activities of the CDC, as well as an opportunity to meet individually with professional staff at CDC. Lectures and tutorials are provided related to the various disciplines at CDC including occupational diseases, surveillance systems, epidemiology, and control measures for both chronic and infectious diseases, and CDC's role in international health. Other topics will be arranged depending on the interests of the group.

BEH 132c,d. The American Household in Demographic Perspective
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Masnick.
Examines in the context of longer historical trends the recent dramatic changes in family structure brought about by changes in patterns of household formation, marriage, separation, divorce, remarriage, childbearing, female labor force participation, and mortality. Implications for elements of the social order receive emphasis, including general integration of age structure, characteristics of the labor force, familial support in health care, and the housing market.

BEH 201b. Health and Behavior: An Introduction to Behavioral Aspects of Public Health
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.
Considers the reciprocal relationship between health and behavior. Reviews attitudinal and sociodemographic factors in preventive health activities and disease.

BEH 203a,b. Demographic Factors in Human Resources Policy and Management
Lectures, seminars. *Two 1½-hour sessions each week. 5 units.* Dr. Masnick, Dr. Stoto (Assistant Professor of Public Policy, Kennedy School of Government).
Considers the importance of demographic trends for human resource issues such as education, health care, labor force, poverty, unemployment, and retirement. Develops ability to work with demographic data to describe a policy situation and to evaluate alternative proposals. Topics include sources of data, population composition, demographic processes, population projection, sub-national variation, household dynamics, lifecourse transitions and intergenerational linkages.

BEH 214d. Behavior/Lifestyle Change and Risk Factor Alteration: Introduction to Methods
Lectures, discussions. *One 3-hour session each week. 2.5 units.* Members of the Department.
Focuses on the planning, implementation, and evaluation of intervention programs addressing the primary prevention of disease. Examines risk factor reduction and life style changes in promoting health.

BEH 215c. Inducing Social Change
Seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Mertens.
Designed for various specialists in public health who are charged with responsibility for introducing changes in organizations and communities. The subject matter includes methods and theories of teaching, principles of individual and group psychotherapy, approaches to sensitivity training and group dynamics, and organizational theory. Techniques and procedures illustrating these theories are presented through readings, discussions, and case illustrations.

BEH 216c,d. Case Studies in Health Promotion
Case Studies. *One 2-hour session each week. 2.5 units.* Members of the Department.
Examines health promotion/education interventions in the U.S. and developing nations. Teaches techniques of intervention design using print and non-print media. Applies basic principles of education and social psychology.

BEH 220c,d. The Epidemiology of Pathological Behaviors: Problems, Concepts, and Methods
Seminars. *One 3-hour session each week. 5 units.* Dr. Wechsler.
Surveys the epidemiology of pathological behaviors and social pathologies. Topics include: psychiatric disorders, alcoholism and drug addiction, suicide, antisocial behavior, smoking, and anorexia. Provides an historical overview of studies using data from treatment services and institutions as well as field studies of the general population.

BEH 221c. Mental Health Factors in Organizations and Industry
Lectures, readings, case illustrations. *One 2-hour session each week. 2.5 units.* Dr. Mertens.
Covers psychological well-being of entire organizations, interpersonal conflict, psychological causes of industrial accidents, industrial and organizational stress, and the organization of psychological units in industry.

BEH 222c. Alcoholism and Alcohol Abuse
Seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Wechsler, Dr. Seixas (Assistant Clinical Professor of Medicine, McLean Hospital).
Covers the diagnosis, prevalence, and etiology of alcoholism and alcohol abuse. Topics include sex and cultural differences, high-risk groups, effects on health, accidental injuries, treatment, prevention, and public policy.

Dr. William McAuliffe, Associate Professor of Sociology.

BEH 223d. Drug Addiction and Drug Abuse
Seminars, discussions. *Two 1½-hour sessions each week. 2.5 units.* Dr. McAuliffe.
Covers the prevalence of drug addiction and abuse. Topics include epidemiology, effects on health, etiology, prevention and treatment, and public policy.

BEH 230c,d. Social and Behavioral Research Methods
Seminars. *Two ½-hour sessions each week. 5 units.* Dr. Gortmaker, Dr. McAuliffe.
Covers aspects of behavioral research methods, including research design, measurement, sampling, data collection, and data analysis. By case studies, methodological readings, and discussion, students learn the conduct and critical evaluation of experiments, surveys, index construction, longitudinal research, and observational studies.
Prereq. BIO 201a,b.

BEH 300a,b,c,d,e. Tutorial Programs
Time and credit to be arranged. Members of the Department.
Arrangements may be made with individual instructors to give a reading course on topics not covered in the Department's course offerings.

BEH 350. Research Training
Training in research is available through individual arrangements with the members of the Department.

The following courses, offered in the Harvard Graduate School of Education, are among those that may be of particular interest to students of the behavioral sciences. They are open to qualified students from the School of Public Health.

Human Development, Counseling, and Consulting Psychology C-230. Community Psychology
Fall term. Katz.

Human Development, Counseling, and Consulting Psychology C-240. Psychological Healing in Cross-Cultural Perspective
Spring term. Katz.

BIO 111c,d. Biostatistics for Medical Investigators
Lectures. *One 1½-hour session each week. 1 unit.* Dr. Simes.
Topics include: role of randomization, replication, and local control; planning of scientific experiments, therapeutic investigations and prognostic factors; concept of a population, mean, and variance; confidence procedures for one and two population problems; analysis of proportions; survival data, life tables, and maximum likelihood estimates.

BIO 112a. Computing Principles and Methods I
Lectures, discussions. *Two 1½-hour sessions each week. 2.5 units.* Members of the Department.
Introductory course designed to provide basic computer literacy to students from all disciplines. Topics include: computer terminology; the organization, capabilities, and limitations of modern computer systems; data collection methods; programming principles; and the design and analysis of information systems.

BIO 113b. Computing Principles and Methods II
Lectures, discussions. *Two 1-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 2.5 units.* Members of the Department.
A practical introduction to the principles of programming using the language BASIC, in order to allow students to utilize personal computers, recently acquired by the School. Topics include: information flow; stepwise refinement of algorithms; structured programming techniques; comparison of programming languages; and the use of statistical packages.
Prereq. BIO 201a,b, BIO 112a or equivalent.

BIO 201a,b. Principles of Biostatistics
Lectures. *Two 1-hour sessions each week.*
Laboratory. *One 2-hour session each week. 5 units.* Dr. Drolette.
Lectures and laboratory exercises acquaint the student with the basic concepts of biostatistics, their application and interpretation. Topics include: descriptive statistics, probability distributions, inference, tests of significance, association, and regression. Laboratory groups will be organized by areas of academic interest or specialization.
Note: This course cannot be counted as part of the credit requirement for a major or minor doctoral field.

BIO 202c,d. Statistical Methods for Epidemiologic Research
Lectures. *Two 1½-hour sessions each week.*
Laboratory (optional). *One 2-hour session each week. 5 units.* Dr. Begg.
Emphasizes concepts and methods for quantifying relationships between variables. Stresses issues in nonexperimental research. Topics include: measures of association, confounding and interaction, multivariate regression, analysis of covariance, one- and two-way analysis of variance, analysis of two-by-two contingency tables, logistic regression, analysis of matched pairs, analysis of rates, and survival data analysis.
Prereq. 201a,b or equivalent.

BIO 203c,d. Statistical Methods in Experimental Research
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Feldman.
Uses extensive examples from laboratory science. Students learn to formulate a scientific question in terms of a statistical model, leading to objective and quantitative answers. Principal topics are analysis of variance and regression, including details of data-analytic technique and implications for experimental design. Also included are probability models and some computing.
Prereq. Bio 201a,b or equivalent.

BIO 204c,d. Vital and Health Statistics
Lectures and discussions. *One 2-hour session each week. 2.5 units.* Dr. Drolette.
Discussion of the types, sources, methods of collection and uses of vital and health statistics for public health purposes. Effective use of existing data will be emphasized together with consideration of incomplete data and sampling methods for obtaining new information, both nationally and internationally.

BIO 205c,d. Mathematical Foundations of Biostatistics
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Drolette.
Material includes: mathematical descriptions of commonly used distributions; standard procedures for estimating the moments of a distribution; and mathematical foundations of statistical inference, including the Neyman-Pearson lemma, the likelihood ratio, the central limit theorem, power and Bayesian inference.
Prereq. A course in elementary calculus.

BIO 207c,d. Survey Research Methods in Community Health
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Bailar.
Research design, sample selection, questionnaire construction, interviewing techniques, the reduction and interpretation of data, and related facets of population survey investigations are covered. Focuses primarily on the application of survey methods to problems of health program planning and evaluation. Treatment of methodology is sufficiently broad to be suitable for students who are concerned with epidemiological, nutritional, or other types of survey research.

EPI-BIO 208a,b. Design and Analysis of Case Control Studies
Not offered 1983-84.
Seminars. *Two 1½-hour sessions each week. 5 units.* Dr. Walker, Dr. Ware.

Topics in Biostatistics
Offered primarily for students majoring in biostatistics or epidemiology, although qualified students from other departments are welcome. The topics covered will vary from year to year, based on recent developments in biostatistics and the research interests of the instructor. Registration requires the permission of the instructor.
In the 1983-84 academic year, two courses will be offered:

BIO 209a,b. Topics in Statistical Inference
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Dempster (Professor of Theoretical Statistics, Faculty of Arts and Sciences).
A discussion of logic and method for dealing with uncertainty in applied statistics, including historical and conceptual analysis as well as technical developments. Description and assessment of alternative approaches to probability and inference from the viewpoint of the subjective interpretation of probability. Sampling models, exchangeability assumptions, and long-run frequency. Postdictive and predictive inference tools. Constructive modelling and inference robustness. Relations to causal inference and decision analysis.

BIO 210c,d. Longitudinal Studies
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Laird, Dr. Ware.
Topics include: growth curves, random effects and time series models, measured and discrete serial response, computing algorithms, and issues in selection bias.

BIO 211a,b. Discrete Data Analysis
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Laird.
Deals with the use of log linear and logistic models for analyzing counted data. Emphasizes practical application rather than mathematical theory. Extensive use is made of computer packages for data analysis. Topics include: the analysis of contingency tables, chi-square and exact tests, measures of association, logistic regression, log linear analysis using iterative proportional fitting, and the binomial, multinomial and Poisson distributions.
Prereq. A course which includes the analysis of variance or permission of the instructor.

BIO 214c. Principles of Clinical Trials
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Gelber.
Designed for individuals interested in the scientific, policy and management aspects of clinical trials. Topics include: types of clinical research, study design, treatment allocation, randomization and stratification, data management and quality control, sample size requirements, patient consent and interpretation of results. Students will design a clinical investigation in their own field of interest and will critique recently published investigations.
Prereq. Previous or concurrent enrollment in an introductory statistics course.
Required for students in the two-year Health Policy and Management Program Medical/Dental Track.

HPM-BIO 216c. Decision Analysis for Health and Medical Practices (Public Policy S-176m)
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Weinstein.
(Course described under Health Policy and Management.)

BIO 217a,b. Probability Theory and Applications
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Amato.
A course in probability theory fundamental to the statistics program. Topics include: algebra of events, axiomatic foundations combinatorial probability, discrete and continuous sample spaces, Lebesgue integration, conditional probability and independence, random variables, generating functions and characteristic functions, standard distributions, expectation and variance operators, limit theorems, Poisson processes, and applications in health-related areas.
Prereq. Intermediate calculus (one or two semesters beyond elementary calculus).

BIO 218c,d. Statistical Inference
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Tsiatis.
A fundamental course in statistical inference. Topics include: methods of estimation, least squares, maximum likelihood, Bayesian methods, properties of estimates, confidence procedures, significance testing, likelihood ratio tests, goodness of fit tests, Neyman-Pearson theory, sufficiency, power and optimality, sequential analysis, nonparametric inference, and decision theory. The theory will be illustrated with examples from health-related research.
Prereq. BIO 217a,b or equivalent.

HPM-BIO 219b,c, 219d. Statistical Methods for Health Policy and Management
Lectures. *Three 2-hour sessions each week plus one optional discussion session. "b,c": 5 units; "d": 2.5 units.*
Dr. Lavin, Dr. Feldstein.
(Course described under Health Policy and Management.)

BIO 220a,b. Multivariate Analysis for Quantitative Data
To be given 1983-84; offered alternate years.
Lectures, student presentations. *Two 1½-hour sessions each week. 5 units.* Dr. Ware.
An introduction to the fundamentals of multivariate analysis and to the analysis of serial measurements. Topics include: the multivariate normal distribution, estimation of the mean and covariance matrix, Hotellings T^2, principal components, and factor analysis. Classical methods for the analysis of repeated measures and longitudinal data reviewed and newer methodology based on random effects and time series formulations presented. Computational issues discussed for both traditional and new methodologies.
Prereq. At least one statistics course beyond the level of BIO 202c,d. Knowledge of matrices, and some familiarity with computer packages such as SPSS, BMD, or SAS.

BIO 240c,d. Design of Scientific Investigations (Statistics 140)
To be given 1984-85; offered alternate years.
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Zelen, Dr. Laird.
Discusses those aspects of statistical theory and practice relative to the design of scientific investigations in the health sciences. Topics include: planning of sample surveys; basic principles of experimental design: randomization, replication, and balance; randomization related to distribution-free methods; fixed, mixed, and random models; experimental designs and techniques for reducing variability; block designs and analysis of covariance; human studies: multicenter longitudinal follow-up and observational studies; sequential studies; adaptive and allocation rules; special features with discrete response data.
Pre- or co-req. BIO 263c,d or permission of instructor.

BIO 251a,b. Data Analysis
Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Dr. Louis.
Discusses the statistical techniques necessary for analyzing data from clinical and biological studies. The concepts underlying statistical techniques are stressed rather than numerical calculation or mathematical derivation.
Prereq. Permission of the instructor.

BIO 261c,d. Theory of Biometry I
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Lagakos.
Discusses the theoretical basis of concepts and methodologies associated with survival data and censoring; nonparametric tests; competing risk models; carcinogenicity testing; and low dose extrapolation. Material is drawn from recent literature.
Prereq. BIO 211a,b or equivalent, or permission of the instructor.

BIO 262a,b. Theory of Biometry II
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Zelen.
A continuation of BIO 261c,d. Topics include: semi-Markov processes as models for disease processes; models of early disease detection; length-biased sampling; optimization and periodic screening; and methods for combining evidence from different experiments.
Prereq. BIO 261c,d.

BIO 263c,d. Regression and Analysis of Variance
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Mehta.
Examines the methods of least squares and maximum likelihood as applied to linear statistical models: multivariate regression, calibration, analysis of variance, and random effects models. Topics include: the development of hypothesis testing, confidence intervals and Bayesian techniques. Exercises and examples emphasize medical applications.
Prereq. BIO 202c,d, 203c,d, or equivalent; familiarity with matrix algebra.

BIO 273a,b. Introduction to Computing
Lectures. *Two 1½-hour sessions each week.*
Laboratory. *One 2-hour session each week. 5 units.* Dr. Pagano.
Introduces the fundamentals of computing, emphasizing algorithms, information flow, and the systematic design of programs in higher-level languages such as FORTRAN. Topics include: the structure of digital computers, programming languages, algorithm development and usage, systems of analysis, and systematic design of programs and computing systems.

BIO 274c,d. Statistical Computing
To be given 1984-85; offered alternate years.
Lectures. *Two 1½-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 5 units.* Dr. Pagano.
Enables students to understand, properly use, and possibly develop statistical algorithms or software. Topics are prompted by statistical procedures or biomedical applications, and include: computer arithmetic, error analysis, numerical techniques, equation solving, matrix operations, approximation and smoothing, optimization, and simulation modeling.
Prereq. BIO 273a,b or equivalent, or permission of the instructor.

BIO 275c,d. Applied Data Management
To be given 1983-84; offered alternate years.
Lectures, demonstrations. *Two 1½-hour sessions each week.*
Laboratory. *One 1½-hour session each week. 5 units.* Dr. Gelman.
Introduces management of data, both external and internal, to computer data bases, concepts and techniques for handling data before it is ready for analysis, and practical aspects of computer data base design and usage. Topics include: data collection, forms and coding, data entry systems, quality control, data base structures (both logical and physical), data base management systems, file organization, and data models.
Prereq. BIO 273a,b or equivalent, or permission of the instructor.

BIO 285a,b. Health Risk Assessment and Appraisal
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Bailar.
Identification of hazards to health, dose-response relationships, exposure assessment, and their integration to an overall quantitative risk assessment. Special attention to environmental hazards that are ill-defined or hard to measure; heterogeneity in sensitivity; conflicting data; and non-random errors. Focus throughout is on risk assessment for use in setting policy.
Prereq. BIO 201a,b or equivalent.

BIO 310-315a,b,c,d. Tutorial Programs
Time and credit to be arranged. Members of the Department.
An opportunity for tutorial work is offered for interested and qualified students or small groups of students. Arrangements must be made with individual faculty members and are limited by the amount of faculty time available. These programs are open to students specializing in biostatistics and also to students in other fields who wish to go beyond the content of the regular courses. Six broad categories of this tutorial instruction are identified by the six course numbers below.

310 *Statistical Methods*
Guided study in specific areas of statistical methodology and application, including participation in the Departmental Journal Club.

311 *Teaching*
Work with the Department in laboratory instruction and the development of teaching materials.

312 *Consultation*
Work with members of the Department on current statistical consultation activities.

313 *Computing*
Guided study in scientific programming, numerical methods, and data management.

314 *Study Design*
Guidance in developing statistical design of a study in which the student has a particular interest.

315 *Data Analysis*
Guidance in the statistical analysis of a body of data in which the student is interested.

Students may register for BIO 310-315 for a maximum of five credit units in the summer term.

BIO 350. Research
Candidates for the Doctor of Public Health, Doctor of Science, or other doctoral degrees may arrange for individual research. The work may be part of the program for a doctorate in this Department or may be integrated with doctoral research in other departments.

CB 202b. Critiques of Current Literature in Virology and Immunology
Seminars. *One 2-hour session each week. 1 unit.* Members of the Department.
Papers on topics of general interest are selected from current periodicals and critically reviewed as to soundness of experimental design, validity and significance of results and conclusions, organization of manuscript, and clarity of presentation. The course will not be given if less than 8 students enroll.

CB 203d. Clinical Problems in Infectious Diseases
Not offered 1983-84.
Lectures, clinics. *One 2-hour session each week. 1 unit.* Dr. Louis Weinstein (Visiting Professor of Medicine, Harvard Medical School).
Problem cases concerning diagnosis, treatment, and control of the common acute communicable diseases of temperate climates are presented, together with discussions of infectious diseases that are usually not considered communicable.

CB 204a,b. Immunobiology
Lectures. *One 1-hour session each week. 1.25 units.* Dr. Greene, Faculty and Guest Lecturers.
The anatomy and physiology of the immune system, fate of antigen, cell trafficking, cellular interactions, and regulation of the immune response, B and T cell recognition mechanisms. Principles of immunoregulation will be discussed in the context of current literature. Grade will be based on class participation and a paper. Students must have basic courses in microbiology and immunology and approval of the instructor.

CB 205a,b/205c,d. Departmental Seminar
Seminars. *One 1-hour session each week. 1.25 units each term.* Dr. Grant, Dr. Reynolds, Members of the Department.
Students and Faculty will present research seminars and current literature reviews. Topics include: chemical and viral carcinogenesis; DNA damage and repair; immunology; molecular biology; radiobiology; and virology.

CB 207c,d. Radiation Biology
Lectures. *Three 1-hour sessions each week. 5 units.* Dr. Little.
This course is divided into two parts: cellular and mammalian radiobiology. The first includes radiation chemistry; cell survival; transformation; and mutagenesis; cytogenic effects; UV-photobiology; and cellular and molecular repair processes. The second covers effects of radiation in man and characteristics of internal and external human exposure. The biologic basis of the acute radiation syndrome and the human epidemiologic data for radiation carcinogenesis are emphasized.
Prereq. ESP 205a,b or college-level course in biology.

CB 212a,b. Introduction to Cancer Biology
To be given 1983-84; offered alternate years.
Lectures and discussions. *Two 1½-hour sessions each week. 5 units.* Drs. Kennedy, Eisenstadt, Cairns, Guest Lecturers.
Emphasizes current experimental approaches to studying cancer biology and the process of carcinogenesis. Topics include: the biology of cell modification and differentiation, the phenotype of the cancer cell, the properties of human and animal cancers, the process of cell transformation, mutagenesis, carcinogen metabolism and the general features of cancer epidemiology and what these say about the causes of human cancer. Early in the course several introductory lectures will be given to cover basic concepts of genetics, cell biology, and molecular biology.
A background in some branch of science is desirable.

CB 217b. Virology
Lectures, seminars. *Three 1-hour sessions each week. 2.5 units.* Dr. Essex, Dr. Mullins.
Provides students with fundamentals of medical virology and introduces the new and relevant concepts emanating from recent and ongoing research. Topics include: virus-host cell interaction, pathogenesis, chronic and latent infections, epidemiology, environmental factors, host defense mechanisms, and community control measures. Selected virus groups discussed in detail. Suggest students discuss enrollment with instructor before registering.

CB 219c,d. Advanced Cancer Cell Biology
(Biophysics 203)
Lectures. *One 2-hour session each week. 5 units.* Dr. Haseltine, Dr. Chen (Associate Professor of Pathology, Harvard Medical School).
This is an advanced level course for those planning to do research in the areas of carcinogenesis, tumor cell biology and cancer pharmacology. Examines the nature of cancer at the molecular level. Explores the differences between normal cells and tumor cells in animals and in tissue culture. Draws upon cell biology, viral oncology, tumor immunology, and genetics. Specific topics include: viral and chemical carcinogenesis, genetics of cancer and the transformed state, the nature of virus coded transformation functions, exogenous control of cell growth, the cell surface of normal and transformed cells, cell structure and mobility, the differences between benign and malignant tumors, the problem of metastasis, and mutation and differentiation as models for cancer.
Suggested prereq. Cell Biology 202, The Biology of the Cancer Cell, Biochemistry 165, Oncogenic Viruses, CB 217b or equivalent.

CB 300a,b,c,d. Tutorial Programs
Time and credit to be arranged. Members of the Department.
Enrollment requires the consent of the staff member responsible for supervision of the research. The various subject areas are listed below by category.

302 *Viruses*
Dr. Essex, Dr. Haseltine, Dr. Mullins.
Isolation and identification of representative viruses by use of cell culture, animal inoculation, and serologic techniques.

303 *Immunochemical Methods*
Dr. Grant, Dr. Greene, Dr. Essex, Members of the Department.
Methodology of immunofluorescence; enzyme-linked immunoassays; 51 Cr-release; chromatography; immunoelectrophoresis; monoclonal antibodies as applied to oncogenesis and resistance to infectious viral agents.

304 *Public Health Laboratory*
Associates at the State Laboratory Institute.
The State Laboratory Institute is engaged in a variety of programs related to public health. These include the development, preparation, and testing of new and standard serums, vaccines, and blood fractions; research in various aspects of applied immunology; various aspects of diagnostic service in the fields of bacteriology, virology, and congenital metabolic disorders; and field studies on arboviruses. Individual arrangements for study can be made in any of these programs.

305 *Tumor Biology*
Members of the Department.
Approaches and techniques for the study of cancer as an infectious disease. Procedures used to study tumor cell and tumor virus marker antigens and antibodies demonstrated. The significance of these markers for epidemiological, etiological, and diagnostic investigations of various tumor systems of known and unknown cause discussed. The relationship between the immune response and the oncogenic process examined.

306 *Cellular Immunology*
Dr. Greene, Dr. Grant.
Examines the events following immunization of infection where the quality and quantity of the immune response is regulated by subsets or lymphocytes and their products. The mechanism of this regulation is explored by analyzing immunologic circuits, idiotypic recognition, and antibody and cell mediated cytotoxicity.

307 *Radiobiology*
Dr. Little, Dr. Kennedy, Dr. Reynolds.
Current topics in Radiobiology at molecular, cellular and organismal levels. Cytotoxic, mutagenic and carcinogenic consequences of ionizing and nonionizing radiations are examined with emphasis on genetic, phyiologic and environmental factors that modify these biologic effects.

308 *Chemical Carcinogenesis*
Dr. Cairns, Dr. Eisenstadt, Dr. Haseltine.
Methodology and interpretation of tests for chemical carcinogens; mutagenesis and repair of DNA; the time course of the formation of cancer.

CB 350. Research
Qualified doctoral candidates, research fellows, and full-time special students may register for CB 350 to undertake original research in virology, bacteriology, immunology, or in one of the disciplines available at the State Laboratory Institute. A number of the current research activities of the Department are indicated under CB 300. Inquiries about specific research opportunities should be addressed to the Chairman of the Department.

ESP 201a, 201c. Principles of Environmental Health I
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Moeller.
Represents a first step in a review of the more important environmental health problems facing society. Topics include: environmental physiology, radiation protection, community air pollution, occupational health, and municipal water purification and wastewater treatment. Students will be required to develop and submit plans for a term paper.
Note: Students in the M.P.H. program are required to take this course, plus either ESP 202b or 203d. For convenience in scheduling, ESP 201 is offered in both the "a" and "c" periods.

ESP 202b. Principles of Environmental Health II
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Moeller.
Represents a continuation in the review of the more important environmental health problems facing society. Topics include: energy and the environment, environmental toxicology and hazardous waste management, environmental law and economics, accidents and public health, insect and rodent control, and environmental monitoring. Submission of a completed term paper is required.
Note: Students in the M.P.H. program are required to take either this course or ESP 203d, plus ESP 201. Enrollment in ESP 202b is recommended for students specializing in one or more of the programs of the Department of Environmental Science and Physiology.

ESP 203d. Principles of Environmental Health III
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Moeller.
Emphasizes environmental health problems in the less developed countries. Topics include: individual household water supplies and wastewater treatment; basic sanitation; insect and rodent control; nutrition and foodborne diseases; housing and home accidents; operation, maintenance and management of environmental systems; environmental manpower and training; and the selection of appropriate technology for coping with such problems. Submission of a completed term paper is required.
Note: Students in the M.P.H. program are required to take either this course or ESP 202b, plus ESP 201. Because of the special orientation of the subject matter presented, it is suggested that students interested in environmental health problems in the less developed countries enroll in ESP 203d. Students interested in the subject matter in this course, as well as that presented in ESP 202b, may take both courses, as well as ESP 201, and receive credit for all three courses (7.5 units).

ESP 204c,d. Environmental Health Evaluation and Management
Seminars, lectures. *Two 1½-hour sessions each week; additional computational sessions to be arranged. 5 units.* Dr. Harrington.
Introduces concepts and analytical methods for the quantitative evaluation and management of man's environment. Topics include: the development of natural resources, resulting environmental conditions, and effects on human health. Where appropriate, mathematical models are developed and critiqued in a systems analysis framework. Students are required to submit a term project.
A strong background in college-level mathematics is assumed.

ESP 205a,b. Human Physiology
Lectures, conferences, demonstrations. *Two 1-hour and one 2-hour sessions each week. 5 units.* Dr. Banzett, Members of the Department.
Students lacking a background in biology are offered an intensive introduction to biological principles and to the physiology of cells, organ systems, and organisms. Some pathophysiology and a number of laboratory exercises are included.
Prereq. College courses in physics, chemistry, and mathematics, or permission of the instructor.

ESP 221a,b. Pulmonary Cell Biology
To be given 1983-84; offered alternate years.
Lectures. *One 2-hour session each week.*
Laboratory/review sessions. *To be arranged. 5 units.* Dr. Brain, Members of the Department, Guest Lecturers.
Surveys pulmonary structure and function, trachea to alveolus, from the viewpoint of cell biology. Examines biological properties of the more than 40 cell types present and considers how cell and tissue functions are integrated to provide for respiration, defense against airborne infection, and other metabolic functions. Knowledge gained in this course helps prepare the student for

research on the lungs and helps give insight into pulmonary disease.
Prereq. College-level course in histology or cell biology; otherwise permission of the instructor. Those without skill in interpreting morphological data will be at a disadvantage.

ESP 222a,b. Structure and Function of the Mammalian Respiratory System (Biology 272)
To be given 1984-85; offered alternate years.
Lectures. *One 3-hour session each week.*
Demonstrations, discussions. *To be arranged. 5 units.* Dr. Brain, Dr. Leith, Dr. Mead, Dr. McMahon (Professor of Biology, Division of Applied Sciences), Dr. Taylor (Professor of Biology, Faculty of Arts and Sciences).
An introduction to the structure and morphometry of the respiratory system of mammals (from lung to mitochondria) integrating structural and morphometric information with physiological data. Requirements include lectures, demonstrations, discussions, term paper, and oral presentations.
Prereq. College-level course in histology or cell biology.

ESP 231a,b. Policy Issues in Occupational Health
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Boden.
Examines the legal, economic, and political foundations of occupational health activities in the United States. Enables students to develop the knowledge and skills in the above areas necessary to apply medical, industrial hygiene, and statistical skills to achieve a healthful workplace. The roles of government, unions, corporations, and research organizations are discussed.

ESP 232c,d. Introduction to Occupational Medicine
Lectures. *One 2-hour session each week. 2.5 units.*
Optional laboratory (Occupational Health Clinic). *One 3-hour session each week. 2.5 units.* Dr. Baker.
Reviews the diagnosis and management of occupational diseases following exposure to specific workplace substances, including asbestos, lead, organic solvents, and other substances. Methods of diagnosis of early organ system effects of chemicals and techniques for assessing disability will be considered. The course is limited to physicians or others with adequate training by permission of the instructor.
Laboratory is limited to physicians and consists of supervised clinical work in one or two occupational health clinics.

ESP 233c. Environmental Toxicology
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Baker, Members of the Department, Guest Lecturers.
Provides detailed information on organ system effects of exposure to workplace chemicals with emphasis on understanding the pathogenesis of toxin-induced disease and on developing programs for early detection of such conditions. Pulmonary effects will receive particular attention. In the second half of the course, effects of exposure to common workplace toxins (e.g. asbestos, lead, solvents, pesticides, other metals, allergens) will be discussed.
Prereq. TOX 204a and ESP 251a.
No credit will be given for ESP 233 until successful completion of TOX 204a.

ESP 234d. Basic Problems in Occupational Health
Lectures. *One two-hour and one three hour session each week. 2.5 units.* Dr. Ferris, Dr. Baker, Mr. Burgess, Dr. Smith.
A problem-solving course using case studies and walk-through field trips to local industries. Emphasis is on the relation of working conditions to health with special reference to the recognition, measurement and control of industrial hazards.
Prereq. ESP 251a.

ESP 235a,b. Critical Review of the Scientific Basis for Occupational Standards
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Baker, Dr. Smith, Dr. Robins, Dr. Boden.
Designed to provide students with the opportunity to review the scientific basis for the association of selected occupational exposures with disease. Special emphasis is placed on critical evaluations of the literature. Reviews occupational cancer and respiratory disease, pathophysiology of respiratory disease and epidemiologic approaches to chemical carcinogenesis. Attention will be directed specifically to the interface of science and regulatory standards.
Enrollment limited to 15.
Prereq. EPI 201a, BIO 201a,b, ESP 234d, or permission of the instructors. EPI 212c,d recommended.

ESP 236c,d. Advanced Methods in the Analysis of Environmental Health Data
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Robins.
Addresses issues in the analysis of environmental health data, and the implications for standard setting. Topics include the modelling of latency, interactions, and the healthy worker effect in

mortality studies; the fitting of cancer models (e.g., multistage) to data; the consequences of misclassification of non-categorical exposures; the analysis of pulmonary function data (e.g., horse-racing effect, regression to the mean).

ESP 237a,b/238c,d. Evaluation of Occupational Health Problems
Not given 1983-84.
Seminars, discussions. *One 2-hour session each week. 5 units each term.* Members of the Occupational Health Program.
Students will examine a specific occupational health problem either as an applied research project or as an analysis and evaluation of an occupational disease control program. The weekly seminar will provide the opportunity for student and faculty review of each project plan, data collection effort, approach to analysis, and final report. Faculty and guests will, in addition, discuss problems of a similar nature and how each have been evaluated and answered.
Prereq. BIO 201a,b, EPI 201a, EPI 202b, ESP 252b, ESP 253c and permission of the instructor.

ESP 241a,b. Occupational Safety Science
Lectures, discussions. *Two 1-hour sessions each week. 2.5 units.* Dr. Keyserling.
Covers the fundamental principles of occupational safety science. Topics include: theoretical models of accident causation, accident investigation procedures, systems analysis, safety standards, safety performance measurement, and product safety. Emphasizes the use of engineering controls and administrative practices to alleviate workplace hazads.

ESP 242c,d. Occupational Biomechanics and Work Physiology
Lectures. *Two 1-hour sessions each week.*
Laboratory. *Three 2-hour sessions during course. 2.5 units.* Dr. Keyserling.
Principles and occupational applications of biomechanics and exercise physiology are presented. Topics include: muscle anatomy and physiology, musculoskeletal mechanics, etiology of occupational musculoskeletal injuries and disorders, energy requirements of work, and systemic responses to work. Emphasizes the use of biomechanical and metabolic models to evaluate occupational stresses and establish safe work practices.
Enrollment limited to 30. Preference given to students in the Occupational Health Program (required for students in Industrial Hygiene/ Safety).
Prereq. ESP 205a,b or equivalent.

ESP 243a,b. Ergonomics/Human Factors
Lectures, demonstrations. *One 2-hour session each week. 2 units.* Dr. Snook.
Emphasizes the design of the job to fit the worker. Specific problems are investigated which result from the nature of the job itself, e.g., low back injuries, fatigue, hand disorders, slips and falls, human error, and psychological stress. The physiological, psychological, and anatomical characteristics of the worker are considered in the development of good job design principles.

ESP 251a. Health Hazards of Manufacturing Processes
Lectures, field trips. *One 2-hour and one 3-hour session each week. 2.5 units.* Mr. Burgess, Members of the Department.
Deals with the recognition of health hazards in the workplace and the atmospheric environment, using a unit operations approach to manufacturing processes. Designed as an introduction to other courses which consider the evaluation and control of hazardous conditions in the workplace and atmospheric environment.
Enrollment limited to 30 and subject to approval of the instructor. Preference given to students in the Department of Environmental Science and Physiology.

ESP 252b. Introduction to Industrial Hygiene
Lectures, seminars, laboratories. *Two 2-hour sessions each week. 2.5 units.* Dr. Ellenbecker, Dr. Smith.
Intended for physicians, nurses, and other health professionals who will work with industrial hygienists in a variety of settings. Designed to familiarize these professionals with the methods used by the industrial hygienist in the prevention of occupational disease, thereby promoting a more effective working relationship. Topics include: the physical form of air contaminants, air sampling and analysis, engineering controls, and the preparation of survey protocols.

ESP 253c. Environmental Control: Industrial Ventilation
Lectures. *Two 1-hour sessions each week.*
Laboratory. *One 3-hour session each week. 2.5 units.* Mr. Burgess, Dr. Ellenbecker.
Intended for industrial hygiene and air pollution students. Covers the design and evaluation of local exhaust ventilation systems for the control of toxic air contaminants released into the workplace by industrial operations and processes.

ESP 254d. Noise and Vibration Control
Lectures. *Two 1-hour sessions each week.*
Laboratory. *Four 3-hour sessions. 2.5 units.* Dr. Ellenbecker, Dr. Cudworth, Mr. Cavanaugh (Consultant in Acoustics).
Introduces the fundamentals of sound and vibration generation, transmission, and reception. Emphasizes the control of environmental noise hazards in industrial workplaces. Basic measurement instrumentation and techniques will be introduced with practical exercises. Noise hazard control methodology will be explored by means of lectures, demonstrations, and field trips to laboratories and industrial plants.

ESP 261a,b. Aerosol Technology
Lectures. *Two 1-hour sessions each week.*
Laboratory. *One 2-hour session each week, "a" period; one 4-hour session each week, "b" period. 5 units.* Dr. Ellenbecker and Members of the Department.

Covers the properties of suspended particulate matter (dust, smoke, clouds) and the physical principles underlying its behavior. Topics include: particle motion due to gravitational, thermal, and electrostatic forces; diffusion; impaction; coagulation; filtration; condensation and evaporation; optical properties; and sizing statistics. Laboratories cover optical and electron microscopy, sampling, and mass concentration and particle size measurement.
Required for concentrators in industrial hygiene and air pollution control.

ESP 262c,d. Identification and Measurement of Air Contaminants
Lectures. *Two 1-hour sessions each week.*
Laboratory. *One 3-hour session each week. 5 units.* Dr. Smith, Members of the Department.
Emphasizes sampling and analytical methods for air contaminants plus related subjects. Included are: chemical and instrumental methods of air analysis, sampling statistics, biological agents, radioactive aerosol determinations, air pollution surveys, and industrial hygiene evaluations.
Required for concentrators in industrial hygiene, air pollution control, radiological health, and occupational safety programs.
Prereq. ESP 261a,b or permission of instructor.

ESP 263c,d. Air and Gas Cleaning
Lectures. *One 2-hour session each week.*
Laboratory. *One 4-hour session each week. 5 units.* Dr. Leith, Dr. Ellenbecker, Members of the Department.
Theory, selection, application, and testing of gas-cleaning devices. Particle collection by inertial, centrifugal, electrostatic, and other forces; gas absorption in liquids, adsorption on solids, and incineration. Laboratory experiments illustrate principles involved.
Prereq. ESP 261a,b.

ESP 264b. Meteorological Aspects of Air Pollution
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Spengler.
Provides the student with a general understanding of the present status of local and long-range dispersion modeling. Also presents an evaluation of the meteorological factors associated with the transport, transformation, dispersion, and removal of air pollutants. Students will learn to recognize and define the parameters of elements in the atmosphere affecting pollutant dispersion and to calculate concentration fields downwind of pollutant sources.
Prereq. Knowledge of calculus.

ESP 265d. Community Air Pollution
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Spengler, Dr. First.
Air quality standards; health effects; damage to animals, plants, and property; community and site surveys; the legal and enforcement aspects of air pollution control.
Prereq. ESP 251a, ESP 264b, ESP 262c,d (may be taken concurrently), or permission of the instructors.

ESP 271a,b. Introduction to Radiation Protection
Lectures, demonstrations. *Two 2-hour sessions each week. 5 units.* Dr. Shapiro, Dr. Moeller.
Covers laboratory, industrial, and environmental sources of radiation; the interaction of ionizing particles with matter; the concept of radiation dose from external and internal sources; radiation measurements; radiation protection standards and regulations; and methods of environmental and occupational radiation protection. (Students desiring laboratory experience in the use of radiation measuring instruments should enroll concurrently in ESP 272b.)

ESP 272b. Introduction to Radiation Instrumentation
Laboratory. *One 2-hour session each week. 1.25 units.* Dr. Shapiro.
Provides an introduction to the use of radiation measuring equipment and supplements the material presented in ESP 271a,b. Exercises cover radiation counting, gamma spectroscopy, and the use and calibration of radiation survey instruments. (This course is available to students in ESP 271a,b who desire laboratory experience in the use of radiation measuring instruments.)
Enrollment limited and subject to approval of the instructor.
Prereq. Previous or concurrent enrollment in ESP 271a,b.

ESP 273c,d. Concepts and Issues in Radiation Protection
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Moeller, Dr. Shapiro.
Involves detailed study of current handbooks and publications related to radiation protection. Areas covered include the regulation of radiation use and the evaluation and control of radiation hazards. Specific topics include: regulatory guides and standards, safety evaluation reports, evaluation of operating experience, risk assessment and emergency planning.
A term report is required.
Prereq. ESP 271a,b and permission of the instructors.

ESP 274c,d. Radiation Protection in Medicine
Lectures. *One 2-hour and one 1-hour session each week.*
Laboratory. *One 3-hour session each week. Time to be arranged. 5 units.* Dr. Webster.
Covers the fundamentals of x-ray equipment, the design of x-ray installations, and procedures for radiation protection surveys and inspections. Included in the course are associated problems in nuclear medicine and teletherapy. Considerations include: equipment and room design, with emphasis on items such as leakage, collimation, filtration, primary and secondary barriers, contamination control, workload, and protection of patients.

ESP-HPM 278a. Introduction to Operations Management
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Shepard, Dr. Evans.
Emphasizes quantitative and descriptive methods for decision making in environmental and health management. Serves as an introduction to operations management, planning, forecasting, optimization, and control.

HPM-ESP 279c,d. Environmental Health Policy Analysis
Lectures, case discussions. *Two 2-hour sessions each week. 5 units.* Dr. Thomas, Dr. Roberts.
(Course described under Health Policy and Management.)

ESP 300. Tutorial Programs
Time and credit to be arranged.
Opportunities are provided for individual tutorial work for qualified students in the fields of respiratory biology, respiratory epidemiology, occupational medicine, industrial hygiene and ventilation, aerosol technology, radiological health, medical radiation physics, nuclear medicine, solid waste management, air pollution control, and environmental health management.

ESP 330e. Field Work
One-week period between fall and spring terms. 1 unit.
A week of supervised field observation is offered to students who may choose appropriate visits to medical or industrial hygiene departments of industries, airports, and other agencies which have operations or research in the field of environmental health. Field work arrangements are generally made early in the fall term.

ESP 350. Research
Doctoral students may undertake theoretical, laboratory or field research under the direction of faculty members working in the following areas:

Air Pollution
Dr. First, Dr. Leith, Dr. Spengler.
Industrial gas cleaning, personal exposure monitoring, assessing air pollution potential from simple and complex pollution sources.

Community Air Pollution
Dr. Ferris, Dr. Speizer.
Health effects of air contaminants, epidemiology.

Environmental Health Management
Dr. Moeller, Dr. Harrington.
Quantitative methods of environmental management, risk analysis, environmental standards and criteria.

Industrial Hygiene
Mr. Burgess, Dr. Ellenbecker, Dr. Keyserling, Dr. Smith.
Monitoring exposures of occupational groups to toxic air contaminants, aerosol, physics, ventilation, ergonomics applications to job design.

Inhalation Toxicology
Dr. Brain, Dr. Valberg.
Biological responses to inhaled particles and gases, deposition and clearance mechanisms.

Mathematical Physiology
Dr. Feldman, Dr. Butler.
Modelling of organ systems, experimental design.

Medical Physics
Dr. Bjarngard, Dr. Webster.
Dosimetry, instrumentation, image quality enhancement.

Occupational Health
Dr. Monson, Dr. Baker, Dr. Boden, Dr. Greaves, Dr. Robins.
Epidemiological and field studies, health hazard evaluation.

Radiological Health
Dr. Moeller, Dr. Shapiro.
Reduction of dose from sources of natural origin, radiation safety criteria and standards, control of radioactive contamination.

Respiratory Mechanics
Dr. Mead, Dr. Banzett, Dr. Loring.
Physiological measurement of respiratory function.

Solid Wastes
Dr. First.
Incineration of solid wastes including municipal, radioactive, biological and laboratory materials.

The following courses, offered in the Harvard Faculties of Arts and Sciences and Government, and at the Massachusetts Institute of Technology, are open to qualified students from the School of Public Health and may be of interest to students of environmental health sciences.

Economics 1010c. Microeconomic Theory
Half course *(fall term). Tu., Th., 8:30-10.*
Scotchmer.
Prereq. Elementary calculus.

Economics 1551. The Political Economy of Environmental Quality
Half course *(spring term). Tu., Th., at 12.*
Dorfman.
Prereq. Social Analysis 10 or permission of instructor.

Engineering Sciences 161. Chemistry of the Aqueous Environment
Half course *(fall term). M, W, F at 1;* Laboratory *Tu. 1-4.* Butler.
Prereq. Chemistry 10 or equivalent.

Engineering Sciences 162. Hydrologic Cycles
Half course *(fall term). Tu., Th. 10-11:30.*
Fiering.
Prereq. Applied Mathematics 21b and one year of college-level physics.

Engineering Sciences 165. Introduction to Environmental Engineering
To be given 1983-84; offered alternate years.
Half course *(spring term). Tu. Th. 11-12:30.* Rogers and Harrington.
Prereq. Engineering Sciences 161 and 162, which may be taken concurrently; Applied Mathematics 21a and 21b or equivalent mathematical background.

Engineering Sciences 260. Engineering Systems for Environmental Control
To be given 1984-85; offered alternate years.
Half course *(spring term). M, W, F at 10.*
Harrington.
Prereq. Engineering Sciences 123 or permission of instructor.

Engineering Sciences 261. Design of Water Resource Systems
Half course *(fall term). Tu., Th. 10-11:30.* Thomas.
Prereq. Applied Mathematics 105a or equivalent, Engineering Sciences 121, 123 or equivalents.

Engineering Sciences 262. Seminar: Technology Choice in Water Resources
Half course *(spring term). Hours to be arranged.*
Rogers.

Engineering Sciences 264. Chemical Aspects of Natural and Polluted Waters
Half course *(spring term). Tu., Th. 1-2:30.* Butler. Prereq. Physical chemistry (e.g., Chemistry 10 or Engineering Sciences 161), and some experience with biology and geology.

Environmental Sciences 267hfr. Seminar: Models for Environmental Systems Planning
Half course *(throughout the year). Tu. 12-2.* Fiering.

M-111. Analysis for Decision Making
Half course *(spring term). W, F., 8:30-10.* Bloom.

S-482. Seminar: Science, Technology, and Public Policy
Half course *(spring term). M., 2-4.* Brooks, Cohen, Zinberg.

M.I.T. 1.143J. Mathematical Optimization Techniques
Nine units *(fall term). Hours to be arranged.* D. H. Marks, H.N. Psaraftis.

M.I.T. 1.146. Engineering Systems Analysis
Nine units *(fall term). Hours to be arranged.* R. DeNeufville and J.P. Clark.

M.I.T. 1.811J. Environmental Law: Pollution Control
Nine units *(fall term).* Ashford and Heaton.

M.I.T. 1.812J. Regulation of Health and the Environment: Selected Topics
Nine units *(spring term). Hours to be arranged.* Ashford, Hattis and Heaton.

M.I.T. 14.121. Microeconomic Theory I
Six units *(fall term). Hours to be arranged.* Solow and Fisher.

M.I.T. 15.065. Decision Analysis
Nine units *(fall and spring terms). Hours to be arranged.* Kaufman.

M.I.T. 15.081J. Introduction to Mathematical Programming
Twelve units *(fall and spring terms). Hours to be arranged.* Orlin and Gallager.

M.I.T. 22.37. Environmental Impact of Electricity
Twelve units *(spring term). Hours to be arranged.* Golay.

Dr. William Hsaio, Associate Professor of Economics.

EPI 201a. Epidemiology in Public Health
Lectures and seminars. *Two 1-hour and one 2-hour sessions each week. 2.5 units.* Dr. MacMahon, Members of the Department.
Describes the place of epidemiology in public health. Sufficient introductory methods are presented to permit description of the applications of epidemiology in public health administration, disease control and public health research. Problems currently prominent in developing and in developed countries reviewed.

EPI 202b. Principles of Epidemiology I: Elements of Study Design and Data Analysis
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Rothman.
For students at the master's level who wish to acquire a familiarity with epidemiologic methods. The principles of study design and data analysis are presented with examples and exercises. The emphasis is on practical rather than theoretical issues. May serve as an introduction to more advanced study or as a final course for those desiring a working familiarity with epidemiologic methods.
Prereq. Knowledge of calculus and EPI 201a or permission of the instructor.

EPI 203c. Principles of Epidemiology II: Problem Conceptualization and Study Design
Lectures. *Two 2-hour sessions each week. 4 units.* Dr. Miettinen.
The course covers in a rigorous fashion the principles of epidemiologic study design. Intended for students preparing for independent research.
Prereq. EPI 202b or permission of the instructor.

EPI 204d. Principles of Epidemiology III: Data Analysis and Inference
Lectures. *Two 2-hour sessions each week. 3 units.* Dr. Miettinen.
The course covers in a rigorous fashion the principles of data analysis in epidemiologic research. Intended for students preparing for independent research.
Prereq. EPI 202b, and enrollment in a biostatistics course beyond BIO 201a,b. or permission of the instructor.

EPI 205c,d. Practice of Epidemiology
Tutorials, seminars. *Tutorial sessions during "c" period; one 2-hour seminar each week during "d" period. 2.5 units.* Dr. Gutensohn, Dr. Hutchison, Dr. MacMahon.
The seminars consist of student presentations of plans for and analyses of epidemiologic data, with discussion by students and faculty. Preparatory work is done under tutorial arrangements with members of the faculty. For the analyses, the emphasis will be on conceptual issues and not on execution.
Prereq. EPI 202b and permission of the instructor. Enrollment limited to 16 students.

EPI 206c,d. Topics in the Theory of Epidemiology
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Hutchison, Members of the Department.
For students who expect to conduct epidemiologic research. Consists of lectures on topics that are not part of the basic methodology covered in other courses in the Department. Topics include: sampling, factors affecting response, data handling, analysis of time-place clustering, cyclic variation, survival, and problems of distinguishing genetic and environmental components of a disease.
Prereq. EPI 201a and BIO 201a,b, or equivalent.

EPI-BIO 208a,b. Design and Analysis of Case Control Studies
√Not offered 1983-84.
Seminars. *Two 1½-hour sessions per week. 5 units.* Dr. Walker, Dr. Ware.
An examination of current analytic options in case-control studies, and the constraints in study design imposed by those options. Students will gain proficiency in both "desk-top" procedures, and multivariate procedures, principally those based on logistic regression.
Students should have mastery of elementary statistical theory, competence in discrete data analysis, and familiarity with underlying principles of epidemiologic studies.
Permission of the instructor required.
Prereq. BIO 211, EPI 204 (may be waived for students satisfying the above).

EPI 211b,c. Epidemiology of Mental Disorders
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Klerman, Dr. Mollica, Dr. Murphy.
Surveys current trends in psychiatric epidemiology. Emphasis is on the development of standardized methods of case diagnosis and application to the epidemiologic study of specific mental disorders. Emphasis is given to affective disorders, schizophrenia, and depression. Special attention focuses on sex differences, social class, risk factors, family studies, and genetics.
Prereq. EPI 201a or equivalent.

EPI 212d. Epidemiology of Chronic Disease: Cardiovascular and Respiratory Disease
Lectures. *One 2-hour session each week. 1.25 units.* Dr. Hutchison.
A review of the epidemiology of the chronic cardiovascular and respiratory diseases. Demographic distribution and time trends of these diseases are presented, and known risk factors are discussed.

EPI 213c. Epidemiology of Cancer
Lectures. *One 2-hour session each week. 1.25 units.* Dr. Gutensohn.
Reviews basic concepts and issues central to cancer epidemiology. Considers the descriptive epidemiology of cancer and discusses the implications of the biology of cancer for identification of risk factors. Examines the role of smoking, radiation, hormones, nutrition, and viruses. Each student prepares a review of the epidemiology of a specific cancer site.
Prereq. EPI 201a.

EPI 214d. Cancer Screening
Lectures. *Two 1-hour sessions per week. 1.25 units.*
A review of principles and results of population screening for the control of malignant diseases. Discussion of the natural history of cancer, characteristics of screening tests, evaluation of early diagnosis and treatment, and the methods and results of screening for cancers of several sites including the breast, cervix, lung and colon.
Prereq. EPI 202b.

EPI 215c,d. Environmental and Occupational Epidemiology
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Monson.
This course has three objectives: (1) to review methods used in evaluating the health effects of physical and chemical agents in the environment, (2) to review available evidence on the health effects of such exposures, and (3) to consider policy questions raised by the scientific evidence. Includes lectures on methodology, seminars on the review and criticism of current literature, and presentations by outside experts on the evaluation and impact of epidemiologic data.
Prereq. EPI 201a and BIO 201a,b.

NUT-EPI 216a,b. Nutritional Epidemiology
Lectures. *One 2-hour session each week. 2.5 units.* Dr. el Lozy, Dr. Willett, Mrs. Witschi.
(Course described under Nutrition.)

EPI 300a,b,c,d,e. Tutorial Programs
Time and credit to be arranged.
Students may participate in departmental research in close association with a staff member. Time and credit are to be arranged with the Chairman of the Department.

EPI 350. Research
In selecting topics for research in doctoral programs, students should consider the fields in which members of the Department are currently working. These include:

Neoplastic Disease
Dr. MacMahon, Dr. Gutensohn, Dr. Hutchison, Dr. Monson, Dr. Rothman.

Congenital Malformation
Dr. MacMahon, Dr. Miettinen, Dr. Rothman, Dr. Yen.

Cardiovascular Disease
Dr. Rothman, Dr. Miettinen.

Effects of Contraceptive Agents
Dr. Rothman.

Environmental Epidemiology
Dr. Monson.

Statistical Methods
Dr. Miettinen.

Nutritional Epidemiology
Dr. Willett.

Virus-associated Chronic Disease
Dr. Gutensohn.

HPM 100a,b. Economic Analysis
Lectures, seminars. *Three 2-hour sessions each week. 7.5 units.* Dr. Hemenway.
Designed to bring students to an intermediate-level understanding of economic theory. Emphasizes the uses and limitations of the microeconomic approach.
Required for students in the two-year Health Policy and Management Program and is the first course in the policy sequence.
May be taken for credit by students who previously have taken HPM 205a,b only with permission of the instructor.

HPM 205a,b. Economic Analysis for Public Health
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Hemenway.
Provides an introduction to the basic principles of economics and economic analysis, particularly as they apply in the public health field. A systematic introduction to microeconomic theory includes the determinants of supply and demand, the theory of markets, and the concept of economic efficiency. Specific topics in health care economics include insurance, hospital behavior, and the market for physician services.
May not be taken for credit by students enrolled in the two-year Health Policy and Management Program or by students who previously have taken HPM 100a,b.

HPM 207a,b. Economics of Health Policy
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Hsiao.
Teaches students to use economic concepts and methods to analyze health policy issues. Applies analytical techniques to dissect complex policy problems and show what insights can be gained. Skills in using several analytical tools are developed, including economic modeling, systematic analysis, econometrics and simulation. Health policy topics examined using these tools include national health insurance, reimbursement of hospitals and doctors, pro-competition, facility and manpower planning. Course especially appropriate for students interested in doing policy analysis for the public or private sectors.
Prereq. One semester each of statistics and microeconomics.

HPM-BIO 216c. Decision Analysis for Health and Medical Practices (Public Policy S-176m)
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Weinstein.
Concerns the methods and applications of decision analysis, cost-effectiveness analysis, and cost-benefit analysis in the evaluation of clinical procedures and health programs. Applications and limitations will be stressed. Examples used to illustrate techniques include: treatment decision for acute abdominal pain, coronary artery bypass surgery, resource allocation in hypertension, evaluation of immunization programs, and risk-benefit analysis for carcinogens.
Prereq. BIO 201a,b or HPM-BIO 219b,c (which may be taken concurrently), or equivalent introductory course in probability and statistics.
Required for students in the two-year Health Policy and Management Program, and is the second course in the policy sequence.

HPM 218d. Seminar on Clinical Decision Analysis
Not offered 1983-84.
Seminar. *Two 2-hour sessions each week. 2.5 units.* Dr. Fineberg, Dr. Weinstein.
Intended to enhance the student's ability to conduct independent analyses of medical decisions. Didactic sessions will critically review published analyses and address selected topics, such as evaluation of diagnostic tests, utility assessment, and use of computer aids. Presumes knowledge of principles of decision analysis.
Required for students in the two-year Health Policy and Management Program: Medical/Dental Track.
Prereq. HPM-BIO 216c, or permission of instructor.

HPM-BIO 219b,c, 219d. Statistical Methods for Health Policy and Management
Lectures. *Three 2-hour sessions each week. "b,c": 5 units; "d": 2.5 units.* Dr. Lavin, Dr. Feldstein.
"**b,c**": Introduces students to probability and statistics emphasizing their application in a variety of health policy and management contexts. Goals include establishing an awareness of basic statistical reasoning and recognition of common difficulties in application. Topics include: distributions, data display, sensitivity, specificity, life tables, representative sampling, confidence intervals, study design, standardization, p-values, power, sample size determinations, testing means and proportions, contingency tables, goodness of fit tests, rate adjustment, regression, correlation, and prediction. The MINITAB package will be used throughout. (*continued*)

"d": Promotes facility with data analysis using regression and time series techniques of analysis with the MINITAB package. Topics include: multiple regression, discriminant analysis, forecasting, analysis of categorical data, and non-parametric methods.
Both the "b,c" and "d" sections are required for students in the two-year Health Policy and Management Program.
Sections may not be taken separately.
May not be taken for credit by students who previously have taken BIO 201a,b.
Prereq. One college-level course in mathematics. Enrollment of students not in the two-year Health Policy and Management Program subject to approval of the instructors.

HPM 220a,b/220c,d. Administrative Systems
Lectures, seminars. *Three 2-hour sessions each week. 5 units each term.* Dr. Barrett, Members of the Department.
Examines issues related to managing health care organizations and develops skills in a variety of functional areas, including: organizational theory, institutional strategy, leadership, change and conflict, financial accounting and analysis, cost accounting, operations management, marketing and management control systems. Classes rely principally on the case method of instruction.
Required for students in the two-year Health Policy and Management Program. HPM 220a,b may be taken separately by other students, but only HPM 220a,b, 220c,d is an acceptable substitute for HPM 221a,b. HPM 220c,d may not be taken separately.
May be taken for credit by students who previously have taken HPM 221a,b.

HPM 221a,b. Managing Health Delivery Organizations
Case discussion and lectures. *Two 2-hour sessions each week. 5 units.* Dr. Young, Dr. Sheldon.
An introduction to the management of health delivery organizations. Topics include: organizational issues, financial management, cost accounting, management control systems, and institutional strategy. Uses case method instruction, supplemented by topical readings, as a vehicle for analyzing management problems and evaluating alternative solutions. Relevant managerial concepts and theories are introduced.
Either HPM 221a,b or HPM 220a,b/220c,d is required for students in the M.P.H. program.
May not be taken for credit by students enrolled in the two-year Health Policy and Management Program or by students who previously have taken HPM 220a,b/220c,d.

HPM 234a. Management Control Systems
Case studies. *Two 2-hour sessions each week. 2.5 units.* Dr. Young.
Builds on the skills and techniques covered in the cost accounting and management control system modules of (HPM 220a,b/220c,d.) Topics include: full and differential cost analysis, budgeting, variance analysis, financial reporting, and programmatic reporting. Uses case method instruction supplemented by topical readings. The principal focus is on general managers in hospitals and community health centers, although some material has a public sector orientation.
Prereq. HPM 220a,b/220c,d or equivalent.

HPM 235d. Seminar on Hospital Cost Containment
Seminar. *One 3-hour session each week. 1.25 units.* Dr. Herzlinger, Dr. Kane.
Designed to be a state-of-the-art, holistic review and analysis of all factors involved in containing hospital costs: providers, intermediaries, regulators, planners, employers, unions, and consumers. First half of class session will be a discussion of relevant literature; second half will be a series of presentations/interactions with outside representatives of specific cost containment efforts.

HPM 238c. Designing, Implementing, and Controlling Management Information Systems
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Young.
Examines issues relating to effective management of computer-based management information systems. Although some technological issues are addressed on occasion, the principal focus of the course is on topics of systems analysis and design, MIS strategies, and organizational behavior, rather than technology. Uses case method instruction, supplemented by topical readings to focus on the role of the general manager in assuring the success of an organization's MIS.
Prereq. HPM 220 a,b/220c,d, HPM 221 a,b, or equivalent.

HPM 239c. Advanced Financial Accounting
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Kane.
Provides the opportunity to develop advanced skills in financial accounting and analysis of financial reports. Covers fund accounting, accounting for inflation, analysis of financial statements and funds flow. Cases draw on both hospitals and other non-profit organizations.
Prereq. HPM 220a,b or equivalent.

HPM 240a. Toward an Agenda for Public Health
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Roberts, Guest Lecturers.
Provides an overview of the problems of setting priorities in public health. Examines the contribution of environmental, economic, social and behavioral factors to the contemporary burden of illness. Analyzes changing definitions of health and disease, and the roles of medicine and public health in dealing with illness. Explores the assumptions and implications of various philosophical positions offered as a basis for resolving priority setting questions.
Required for students in the Health Policy and Management Department.

HPM 241b. Health Care Delivery in the U.S.: History and Sociology
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Thomas, Members of the Department.
Offers an introduction to contrasting sociological and historical accounts of the U.S. health care sector. Historical materials and contemporary case studies are used to analyze the roles of providers, patients and other political, cultural and social factors in determining the current objectives and institutional arrangements in this sector. The central role of physicians and "medical science" in health care is emphasized, and its implications for institutional reform explored.
Required for students in the two-year Health Policy and Management Program: General and Medical/Dental Tracks.
Prereq. HPM 240a.

HPM 242c,d. The Health Care Delivery System: Political and Economic Analysis
Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Dr. Feldman, Dr. Hsiao.
Examines major health care delivery issues, and the development and implementation of policies and programs designed to address them using several frameworks including that of economic and political analysis. Topics include: health manpower, health care finance, health care access and utilization, the supply of and demand for medical care facilities, and health planning and regulation.
Required for students in the two-year Health Policy and Management Program: General and Medical/Dental Tracks.
Prereq. HPM 100a,b, HPM 205a,b, or equivalent with permission of the instructor.

HPM 244c,d. Health Services Planning
Two 2-hour sessions each week. 5 units. Dr. J. Brown.
Introduces health planning concepts, methods, applications, and practice in the public and private sectors. Teaches and critically examines selected quantitative methods, including hospital strategic planning and incremental cost analysis. Appraises the historical and future roles of health planners and planning in the United States. Designed for all students concerned with long-range resource allocation and its social effects in developed countries, as well as for students preparing for planning or strategic management positions in hospitals and government.

HPM 248a,b. Contemporary Issues in Health Policy
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Feldman.
Examines from a variety of analytic perspectives three to four health policy issues of current political importance. Issues might include, for example, long-term care for the elderly, services for the mentally ill, the dissemination and regulation of medical technology and/or the impact of "New Federalism" on health funding and health services. Analysis will focus on 1) alternative problem definitions and policy goals, 2) available evidence on policy impacts, and 3) economic, political and other criteria for choosing among various policy alternatives.
Prereq. HPM 240a, 241b, 242c,d or the equivalent introduction to economic and political analysis of the health care system.

HPM 250d. Policy Implementation
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Thomas.
Intended to help students think systematically about some of the reasons public programs succeed or fail. It assumes that the choice of appropriate and effective institutional arrangements for accomplishing policy goals is itself an important policy question. Examples are taken from a variety of policy areas.
Required for students in the two-year Health Policy and Management Program, and is the third course in the policy sequence.
Presumes knowledge of material presented in HPM 100a,b (or HPM 205a,b) and HPM-BIO 216c.

HPM-MCH 252a,b. Public Health Law and Human Rights
Lectures. *One 2-hour session each week. 3 units.* Dr. Mariner, Dr. Curran.
Entails a comprehensive examination of human rights as they bear upon health programs, nationally and internationally. Among topics considered from ethical, cultural, and legal viewpoints are rights to medical care and a healthy environment, equality, rights of medical patients, women, children, and experimental subjects, and problems of balancing personal rights and community protection.
This course includes basic constitutional law material and is not intended for students with prior legal training.
Enrollment limited. Auditing and convenience attendance not permitted.

HPM 253e. Government and Private Funding for Research and Health Care Programs
Lectures, discussions, workshops. *To be arranged. 1 unit.* Members of the Department.
To carry out research or develop needed health care programs, managers and policy analysts need to be able to obtain funding from federal, state, and local government sources, and from foundations and corporations. This course aims to enable participants to demonstrate in a clear and concise proposal an understanding of the issues and facility with methodological design, and to explore potential sources of funding. Requirements for proper administration of funds are also discussed. Proposals are prepared and critiqued in the workshops.
Prereq. Exposure to research issues in health care or program development and permission of the instructor.
Students should enroll during the first week of b period (by November 21, 1983).

HPM 254c. Risk Management Programs, Quality Controls, and Compensation Policies
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Curran.
Focuses upon the development, implementation, and evaluation of risk management programs and legislative reforms in patient compensation plans. Attention will be given to medical and hospital malpractice experience, key legal decisions in the area, and legislative reform movements setting up arbitration, screening panels, tort-law changes, no-fault mechanisms, etc. The inter-relationship of quality of care standards and quality assurance to malpractice vulnerability and risk management programs will be a primary focus of attention.
HPM 257b and HPM 258d advised, but not required.

HPM 255d. Reimbursement Systems
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Kane.
Examines issues related to the general theme of third-party reimbursement for health care institutions. The principal focus is on hospitals. Issues include: cost containment efforts, hospital perspectives, and the role of incentives. Some specific systems are examined in detail in order to assess the feasibility of certain techniques and to address questions of overall reimbursement system design.

HPM 256c,d. Health Insurance Industry: Its Structure and Effects on Health Care
Not offered 1983-84; offered alternate years.
Seminar. *One 2-hour session each week. 2.5 units.* Dr. Hsiao.
Examines the health insurance industry and how it affects patients, hospitals, physicians and dentists. Provides students with an understanding of the industry's structure, the types of firms in this industry, their internal operations, product design and reimbursement policies. Analyzes how the decisions of insurance firms affect access to health services, diffusion of medical technology, hospital costs, physician and dental fees, and competition in medical care.

HPM 257b. Physician Performance: Facilitators and Constraints
Seminars, case discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Palmer.
Examines circumstances and programs which facilitate or constrain quality of physician performance. Issues discussed include public expectations of physician performance, inherent task constraints, cost-tradeoffs, effect of practice setting and specialization, selection, education, licensure, and specialty certification of physicians, malpractice and risk management, impaired physician programs, and utilization review programs.
Experience in medical care delivery an advantage, but not required.
Course is followed by the optional sequels HPM 254c and 258d.

HPM 258d. Evaluation of Quality of Health Care
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Palmer, Visiting Lecturers.
Examines issues in defining "quality in health care" and the choice of methods for assessing and improving quality of health care. Recent research is reviewed and operating programs, including the PSRO experience, are analyzed.

Presentation includes case materials from quality of care evaluation programs in both hospital and ambulatory settings.
Additional sequel to HPM 254c and HPM 257b.

HPM-POP 262c,d. Health Planning in Developing Countries
Lectures, seminars. *Two 2-hour sessions each week.* Laboratory. *One 1-hour session each week* (optional). *5 units.* Dr. Cash, Dr. Shepard.
Deals with skills needed for health planning through lectures, problems, and case studies. Strong emphasis is placed on the economic analysis of health issues in developing countries. Selected concepts and techniques of political analysis, microeconomics, cost-effectiveness and cost-benefit analysis, and projection of recurrent costs are presented and applied to health care programs. These techniques are then incorporated into a planning context in analyzing and developing recommendations around selected health plans. Emphasizes practical and applied work.
ID 209b or experience in developing countries is recommended, but not required. A background in economics is not required.

POP-HPM 263c. Case Studies in Design and Management of Population and Community Health Programs
Case discussions, seminars. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.
(Course described under Population Sciences.)

POP-HPM 264d. Case Studies in Comparative Design and Management of Population and Health Programs
Case discussions, seminars. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.
(Course described under Population Sciences.)

HPM 266d. Program Implementation in Developing Countries
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Henn.
Provides an overview of the circumstances in developing countries which affect the implementation of health programs. Assists students in the adaptation and application of management techniques to deal with typical Third World health program implementation issues. Topics include: decentralized management, manpower development, community participation, financing, supervision and motivation, logistics, evaluation and redesign, information system development and donor coordination.

HPM 275a,b. Dental Public Health Practice
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Yacovone.
Provides in-depth training in the administration and planning of dental health programs. Subjects include: community needs, resources, surveying, fluoridation, prepayment, and program evaluation. Each student develops a program plan in a specific area of community dental needs and presents the plan to the class.

HPM 276c,d. Dentistry and Social Policy
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Yacovone.
Investigates relationships between the social sciences and dentistry. Subjects include: the role of the social sciences in dentistry, psychosocial interaction of doctor and patient, client perceptions of dentistry, interpersonal relationships in group practice, and the sociopolitical influence of dentistry as an organization.

ESP-HPM 278a. Introduction to Operations Management
Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Shepard, Dr. Evans.
(Course described under Environmental Science and Physiology.)

HPM-ESP 279c,d. Environmental Health Policy Analysis
Lectures, case discussions. *Two 2-hour sessions each week. 5 units.* Dr. Thomas, Dr. Roberts.
Using the case method, demonstrates the application and analytic and technical skills to actual policy situations. The multidisciplinary approach will emphasize the technical uncertainties and the evaluative and institutional complexities surrounding environmental policy issues. Policy questions will be considered in an organizational context permitting students to consider the uses and limitations of formal methods of analysis.
Prereq. Previous course work in policy, management, or environmental health sciences.
Required for students in the two-year Health Policy and Management Program: Environmental Track.

HPM 290a,b,c,d. Applied Research Seminar
Seminars. *One 2-hour session each week.*
Field work. *One day each week. 10 units.* Dr. J. Brown, Members of the Department.
Teaches students to apply analytic and managerial methods to concrete problems. Each student defines and proposes solutions to an important problem confronting an institutional sponsor. Students learn research methods and problem-solving techniques during the 'a' period while

developing project contracts with sponsors. In subsequent seminar meetings, students, sponsors, and faculty advisors present and discuss study methods and findings. Students also meet individually with seminar faculty and designated faculty research advisors. Students prepare a "context/methods" paper during the first semester and a final project report due at the end of the year.
Required for students in the two-year Health Policy and Management Program.
Prereq. Completion of the first year of the Health Policy and Management Program.

HPM 295a,b. Doctoral Seminar on Research Methods
Seminar. *One 3-hour session each week. 5 units.* Dr. Roberts, Members of the Department.
Sensitizes students to variations in scientific methods and approaches among the various disciplines that relate to public health and enables them to design projects and choose methods appropriate to the questions they wish to pursue. It is not intended to explore statistical issues from a technical perspective, but rather to offer a philosophical and sociological analysis that places various clinical, experimental and observational approaches to empirical research into a single, coherent analytical context.
Prereq. Enrollment in the Health Policy and Management doctoral program and/or similar background and experience.

HPM 296c,d. Economic and Political Theory in Health
Seminar. *One 3-hour session each week. 5 units.* Dr. Thomas, Mr. Marks.
Examines the uses of economic and political theory in explaining and assessing the operation of health care institutions and the quality of health policy. Contrasts the governing assumptions and reviews contemporary discussions of contractarian, utilitarian, institutionalist and Marxist perspectives. Topics include: role of markets and political processes; the model of rational behavior; equity, rationality and efficiency in social choice; strategies for reform and social change.
Prereq. Enrollment in the Health Policy and Management doctoral program and/or course work in microeconomics.

HPM 300a,b,c,d,e. Tutorials
Time and credit to be arranged.
Students may make individual arrangements to do work under the guidance of a member of the department. This work may include readings or special projects.

HPM 330. Field Work
Time and credit to be arranged.
Students are assigned to work on special projects such as group surveys, other types of field projects, or observation of and limited participation in the work of health agencies. Field assignments are made on an individual basis to meet the needs of each student insofar as possible. Work in the field is coordinated with courses in the Department, and is offered through the Community Health Improvement Program.

HPM 350. Research
Doctoral candidates may register for HPM 350 to undertake individual study and research.

Attention is directed to courses described under Interdepartmental Courses.

MCH 200a. Growth and Development I
Lectures, self-instructional material. *Two 2-hour seminars/lectures weekly. 2.5 units.* Dr. Tanner, Dr. Valadian.
Instruction in physical growth, development, maturation and aging is presented in programmed, self-instructional material, and by weekly lectures. Covers topics necessary for the advanced study of growth and development, but also provides an understanding of assets and needs which constitute a basis for health services. Designed for MCHA students who do not have a strong background in physical development, but may also be taken by health providers who wish to refresh their knowledge.

MCH 201b. Growth and Development II: Advanced Seminar
Not offered 1983-84.
Seminars. *One 2-hour session each week. 1.25 units.* Dr. Valadian.
Describes and integrates the characteristics of human growth and physical development which occur during the selected life stages from conception to maturation. Intended for students with special interest in human development. Considers implication of child growth and development of these periods for health services and further research.
Prereq. MCH 200a or permission of the instructor.

MCH 202c. Growth and Development III: Factors Affecting Growth and Development
Lectures, seminars. *One 2-hour session each week. 1.25 units.* Dr. Valadian.
Explores definable influences that act on the course of physical growth and development from conception to maturity. Emphasis is placed on understanding the nature of the factor and its direct effects, as well as on how factors interrelate to produce some characteristics of mature individuals. This course also considers implications of factors for planning and providing health services and for future research.

MCH 203e. Primary Maternal and Child Health Care
Seminars, lectures, field visits. *Full-day sessions. 1.25 units.* Dr. Gardner.
Introduces the student to principles of organization and administration of primary health care services for mothers and children. Concepts of primary care, neighborhood health centers and quality assurance are presented. Seminars focus on the issues and problems presented in the field visits. The community programs selected are diverse, including neighborhood health centers, private practice, hospital primary care, HMO and/or university health care.
Must register by October 15; enrollment limited to 12 students.

MCH 204a,b. Content of Maternal and Child Health Programs
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Gardner.
Components of health care programs for mothers and children are discussed as they vary to meet changing needs resulting from growth and maturational processes. Health programs appropriate to maternity, early and late childhood, adolescence, and youth are presented in terms of the multidisciplinary and interdisciplinary action they require. Also included are the historical background and the relationship of maternal and child health programs to social, mental health, education, and other systems; the course discusses factors which shape current and future maternal and child health policies and services.

MCH 205c,d. Planning, Implementation and Evaluation of Maternal and Child Health Programs
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Valadian, Members of the Department, Guest Lecturers.
Considers the organization and administration of national, state, and local health programs for mothers, infants, children and adolescents, and services for children with handicapping conditions. Selected issues examined such as developmental disorders, Sudden Infant Death Syndrome, day care, school health. Emphasis placed on financing, planning, implementing, and evaluating MCH programs in the U.S.

MCH 206c,d. Maternal and Child Health in Developing Countries
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Valadian.
Parallels MCH 205c,d. Emphasizes factors which shape MCH programs in rapidly changing social and cultural environments, particularly the interactions between health, nutrition and poverty. Studies selected programs by age periods from various areas of the world and the processes of planning, financing, implementing, and evaluating such programs in relation to other sectors. Individual or small group case study projects are required.

MCH-NUT 207c,d. Nutrition in Child Growth and Development
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Dwyer.
Principles and practical problems encountered in the nutritional aspects of child growth and development are examined. Lectures on general principles are designed to help students base their judgments on scientific evidence. Discussions deal with a variety of nutrition case studies and simulations illustrative of problems in both developing and highly industrialized countries.

MCH 208d. Rural Health Services
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Hayes.
Lectures and discussions focus on the special problems of rural communities impacting on MCH services delivery, cultural characteristics, resources available and innovative approaches to problems, with selected examples in rural areas. Emphasis placed on doing needs/demands assessments or community diagnosis which structure planning for the health needs in isolated communities. Topics include transportation problems, environmental health hazards, and rural health concerns in developing countries.

MCH 209c. Services for Children with Handicaps
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Crocker.
Provides a review of the handicapping conditions of childhood: mental retardation, physical disability, sensory and communication disorders, and emotional disturbance, as these affect development, adjustment, and family resources. The service system will be analyzed with regard to health care, developmental support, education, residential options, and prevention.

MCH 210a. An Introduction to Personality and Cognitive Development
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Walker.
The basic principles of child growth and development in the cognitive and the psychosocial domains are examined in this introductory course. Special emphasis placed on understanding the theories and research of Piaget, Freud, Erikson, and others, as well as the implications of these contributions to the planning and implementation of medical and/or related social and educational services for children and youth.

MCH 211c. Health Care of Women
Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Gardner.
Considers critical issues of health care and the common problems of women, including the changing role of women in contemporary United States society. These health problems are addressed in terms of their epidemiology and the impact of technology on their detection and treatment viewed from biological, medical, behavioral, and legal perspectives.
Enrollment limited to 20 students.

MCH 212d. Childhood Mental Disorders: Public Health Perspectives
Lectures, seminars. *Two 2-hour sessions per week. 2.5 units.* Dr. Deykin, Dr. Rauh.
Examines the occurrence and known risk factors of selected mental disorders of childhood and adolescence including autism, depression, hyperactivity, and anorexia. Emphasis is on the methodologic issues of case definition, disorder classification, current diagnostic and screening instruments, and on the advantages/disadvantages of available data sources. Readings will include studies selected to illustrate methodologic options and usefulness for public health policy.

MCH 213d. Obstetric Epidemiology
Lectures, seminars. *One 2-hour session each week. 1.25 units.* Dr. Sachs.
Tackles controversial issues in maternal health through techniques in epidemiology applied to obstetrics. Focuses on maternal mortality, obstetric and gynecologic morbidity, evaluation of obstetric health care, populations at risk such as pregnancies in women over 35. Examines the epidemiology of prematurity, and current issues such as breast feeding, home births, Cesarian Sections, fetal monitoring.

MCH 214a,b. The Elderly Person in the Health Care System (HMS Geriatrics 702)
One 3-hour session each week. 2.5 units. Dr. Laurence Branch (Assistant Professor of Social Medicine and Health Policy, Harvard Medical School).
Uses a variety of public health perspectives to analyze the health needs of the elderly and services to meet them. Topics include: demographic background of the "graying" of America, normal and pathological aging processes, epidemiology of geriatric illness, design and administration of present service programs for elders, and consideration of alternative forms of long term care.

MCH 220c. Social Services for Infants and Children
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Deykin.
Introduces students to the crucial role of social services in maintaining and promoting health in populations with specific reference to mothers and children. Beginning with an historical overview of social services in the U.S., the course examines the major welfare programs (AFDC, SSI, Title XX, nutritional programs), their administration, funding mechanisms, goals and strategies. The political forces and the changing social needs which modify the content of social services are discussed. Analyzes the social and psychological determinants of the need for as well as the utilization of services; focuses on hospitalized, impaired, and terminally ill children as well as on children in need of foster care and adoption.

MCH 221d. Social Services for Adolescents and Women
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Deykin.
A continuation of 220c, this course discusses the range of social services designed to meet the needs of older children, adolescents and mothers. Services for abused children, for alcoholic and addicted youth, for pregnant teenagers, and for victims of family violence will be presented in the light of changing funding and governmental responsibility.
Prereq. MCH 220c or approval of the instructor.

HPM-MCH 252a,b. Public Health Law and Human Rights
Lectures. *One 2-hour session each week. 3 units.* Dr. Mariner, Dr. Curran.
(Course described under Health Policy and Management.)

MCH 300. Tutorials
Time and credit to be arranged.
Students at the master's level may arrange to work individually or in small groups under the guidance of a faculty member. The work may include participation in departmental research, specialized readings, field projects in a local or state health agency, or small studies to examine more in-depth topics introduced in various courses such as: planning and evaluation of MCH services for children with handicapping conditions.

Tutorials will be offered depending on students' interests and will be limited by the amount of faculty time that is available. Arrangements must be made with individual faculty members.

MCH 330. Field Study
One-week period between fall and spring terms. 1 unit.
Field study will be arranged on an individual basis to meet the special needs of each student insofar as possible. A group field study to Mississippi is offered prior to the course MCH 208.

Additional Field Study
Students who lack sufficient previous experience are encouraged to undertake a period of field study before registration or after completion of the academic year, in a program arranged by the staff of the Department. No credit is allowed for such field study.

MCH 350. Research
Doctoral students are required to undertake research in maternal and child health or aging.

NUT 201a,b. Principles of Nutrition
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Thenen.
An in-depth study of nutrients in relation to human health. The essential nutrients, their requirements and their functions in the organism will be covered, as well as the important health issues related to nutritional deficiencies and excesses in industrialized countries. Provides the foundation for other courses in nutrition.

NUT 202c. Nutrition Policy and Management—United States
Two 1½-hour sessions each week. 2.5 units. Dr. Austin, Members of the Department.
Deals with the formation of food and nutrition policies and the operation of nutrition intervention programs aimed at the major nutritional problems in the United States. Case study approach applied to evaluate the major U.S. nutrition programs and policy issues (school lunch feeding, WIC program, nutrition and aging and development of a national nutrition policy). Local, state, and national perspectives will be explored.
Prereq. NUT 201a,b or permission of the instructor.

NUT 203d. Nutrition Policy and Management—Developing Countries
Two 1½-hour sessions each week. 2.5 units. Dr. Austin, Members of the Department.
Deals with the problem of malnutrition in developing countries. Using case study approach, the course will examine the design, planning and implementation of food and nutrition policies as well as the design and management of specific nutrition programs. The nutrition programs which will be examined include fortification, nutrition education, supplementary feeding, consumer subsidies, and agriculture.
Prereq. NUT 201a,b or NUT 210a,b or permission of the instructor.

NUT 204a,b/204c,d. Departmental Seminars
Seminars. *Two 1-hour sessions each week. 2.5 units each term.* Dr. Owen, Members of the Department.
Students participate in and present seminars reviewing current research and publications related to nutrition in addition to attending advanced seminars presented by faculty and guest speakers. Beginning students learn skills required for oral presentations. Topics include both basic research and applied areas of nutrition.

NUT 205c,d. Biochemistry and Physiology of Nutrition
Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Franceschi, Members of the Department.
The biochemistry and physiology of carbohydrates, fat, protein, vitamins, and minerals are integrated from the nutritional perspective. Course provides an in-depth analysis for students with a major interest in nutritional biochemistry.
Prereq. Course in biochemistry and permission of the instructors.

MCH-NUT 207c,d. Nutrition in Child Growth and Development
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Dwyer.
(Course described under Maternal and Child Health and Aging.)

NUT 208c,d. Nutritional Aspects of Human Disease
Lectures, case presentations, discussions. *One 2-hour session each week. 2.5 units.* Dr. Herrera-Acena, Dr. el Lozy, Mrs. Witschi.
Reviews the role of diet in the causation and management of clinical obesity, diabetes mellitus, coronary artery disease, anemia, liver disease, alcoholism, gastrointestinal disorders, and renal disease. Early detection and prevention of these nutrition-related disorders considered.

NUT 209a,b. Food Science and Nutrition
Lectures, discussions. *Two 1-hour sessions each week. 2.5 units.* Mrs. Witschi, Dr. Samonds, Members of the Department.
Deals with nutrition in terms of the foods which supply mankind's nutrient needs, their composition and physical properties, and the positive and negative effects on nutrient qualities of food of genetic manipulation, agricultural practice, processing, storage, and cooking. The historical development of food technology, including methods of preservation and sanitation, is related to current methods employed in both developing and industrialized countries.

NUT 210a,b. Nutrition Problems of Less Developed Countries
Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Herrera-Acena.
The nutrition problems of less developed countries are discussed in the context of basic human needs. The ecology and the biological and behavioral consequences of malnutrition are reviewed in detail. Special emphasis on issues in human biology relevant to the formulation of nutrition policy and programs.

NUT 214a,b/214c,d. Research Techniques in Nutritional Biochemistry
Lectures. *One 1-hour session each week.*
Laboratory. *Fifteen hours minimum each week. 5 units each term.* Dr. Geyer, Members of the Program in Nutritional Biochemistry.
Students have the opportunity to rotate through the laboratories (one each period) of faculty members in the Nutritional Biochemistry Program in order to learn current techniques applied to nutritional, cellular, and biochemical research. Weekly lectures will emphasize the theory behind the instrumentation utilized in the laboratory. Oral and written presentations of research accomplished by the student to the Nutrition Faculty as required. Generally limited to students in the Nutritional Biochemistry Program; others may enroll if laboratory space is available or may take the lecture portion only for reduced credit (1.25 each term).

NUT-EPI 216a,b. Nutritional Epidemiology
Lectures. *One 2-hour session each week. 2.5 units.* Dr. el Lozy, Dr. Willett, Mrs. Witschi.
Reviews methods for assessing dietary intakes of populations and individuals. Students will gain experience in the actual collection, analysis (including conversion to nutrients by computer) and interpretation of dietary intakes. Case studies follow, involving specific diet disease relationships integrating information from international studies, secular trends, clinical trials, analytical epidemiology, and animal experiments.
Prereq. BIO 201a,b, EPI 201a, and permission of the instructor for students who have not taken a course in nutrition.

NUT 300a,b,c,d,e. Tutorial Programs
Time and credit to be arranged.
Individual work under direction may be arranged. This can include laboratory studies, projects in applied nutrition, or library research.

NUT 351-368. Research
Time and credit to be arranged.
Facilities are available for doctoral students to do advanced work in nutrition along the lines of fundamental or applied research as related to public health and medicine. Areas currently receiving intensive and comprehensive study in the Department are as follows:

351 Dr. Geyer
Effects of growth factors and hormones on the metabolism of human cells in culture; nutrition and metabolism of isolated organs; complete blood replacement *in vivo* with artificial preparations.

352 Dr. Goldman
The metabolism of food constituents and drugs particularly as carried out by intestinal bacteria. Emphasis given to areas of metabolism that may help to understand a compound's biological activity.

353 Dr. Lown
Coronary artery disease; etiology of sudden death; derangements of the heart beat; exercise physiology; electrolyte metabolism.

356 Dr. Antoniades
Regulation of cell growth by hormonal growth factors derived from human serum or platelets; platelet-derived growth factor and atherogenesis; mechanisms of hormone transport and regulation.

357 Dr. Hayes
Nutritional pathology with specific interest in diet and disorders of lipid and lipoprotein metabolism, particularly atherogenesis in non-human primates.

358 Dr. Herrera-Acena
The role of nutrition and other environmental factors in the etiology and management of diabetes mellitus; the relationship of malnutrition to physical and cognitive development.

359 Dr. el Lozy
The quantitation of malnutrition in children in developing countries on the basis of anthropometric measurements; studies of mathematical models of growth; application of these models to the study of growth in chronic diseases of childhood (diabetes, cystic fibrosis, etc.).

361 Dr. Thenen
Early development and the role of nutrition in obesity and insulin resistance in experimental animal models; effects of marginal folic acid deficiency on reproduction, hemopoiesis and resistance to infection; biochemical defects in vitamin B_{12} deficiency.

362 Dr. Verrier
Influence of neural factors, psychologic conditioning, and myocardial ischemia on susceptibility to ventricular arrhythmias and sudden death.

363 Mrs. Witschi
Computer-based interactive dietary history, analysis, and counseling programs.

364 Dr. Austin
Cost effectiveness of infant and child supplemental feeding in the United States. Cost-benefit methodology for assessing safe levels of food additives.

366 Dr. Franceschi
Control of intestinal calcium absorption by 1,25-dihydroxyvitamin D_3, a steroid hormone. Regulation of gene expression by steroid hormone receptors. Mechanism of intestinal calcium transport.

368 Dr. Owen
Hormonal regulation of nutrient uptake and membrane function in human cells. Mechanism of action of growth factors. Regulation of amino acid transport and protein synthesis.

Admission limited and subject to approval of the instructor.

POP 191a,b. The Spatial Aspects of Societies (Sociology 191)
Lectures. *Two 1-hour sessions each week. 5 units.* Dr. Alonso.
Stresses the interaction of societies and their geography, focusing primarily on the historic and current development of the United States. Consideration is given to technology, institutions, ideology, health, the economy, and other factors influencing the growth and shape of cities, their relations to each other and to rural areas.

POP 200a,b. Introduction to Population Sciences
Lectures. *One 2-hour session each week. 2.5 units.* Professor Bell, Members of the Department.
Reviews the basic elements of population change—fertility, mortality, and migration—and their interaction with social, cultural, and economic characteristics of societies at each stage of the demographic transition, i.e., for both developed and developing countries. Introduces basic demographic concepts and methods, including age-sex pyramids, life tables, and demographic rates.

POP 201a,b. Introductory Seminar on Population Sciences
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Wyon, Members of the Department.
Supplements the introduction to population sciences presented in POP 200a,b. Most students will be concurrently enrolled in 200a,b. Through in-depth study of two or three defined human communities, students learn how to trace immediate and underlying causes of rates of birth, death and migration as they have changed through the past one or two centuries, with inferences for the goals of public health and population policies and programs. Short papers are required.

POP 202c,d. Student Project Design Seminar
Seminars. *One 2-hour session each week. 2.5 units.* Dr. Wyon, Members of the Department.
Oriented toward health and population problems of communities. Each student selects a community and an appropriate health or population problem. He/she presents a critical survey of the relevant literature and a project design, to amplify understanding of the relative frequency of the selected problem in relation to other health or population problems of the community, and to increase or test the available knowledge of causes of the problem.
Prereq. Introductions to biostatistics, epidemiology and (preferably) population sciences. Enrollment after interview with instructor.

POP 204c,d. Biological Basis for Fertility Control
Lectures. *Three 1-hour sessions each week. 5 units.* Dr. Salhanick, Members of the Department.
Presents the fundamental physiology and biochemistry related to known and potential methods of family planning. Topics include: the biosynthesis, secretion, effects, and modes of action of the gonadal and gonadotropic hormones; the relationship of the natural steroid hormones to synthetic analogues is also discussed. A short paper or presentation may be required.
Prereq. Appropriate science background or permission of the instructor.

POP 205a,b. Introduction to Demographic Analysis
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Potter.
Reviews fundamentals of the measurement and analysis of mortality, nuptiality, fertility, migration, population growth and age structure. Topics include: sources of demographic data, demographic rates, cohorts and periods, model life tables and models of nuptiality and fertility, stable population theory, and population projections. Students will have the opportunity to analyze the demographic future of selected countries such as the United States, Mexico and China.

POP 206c,d. Demographic Methods for Developing Countries
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Larson.
Reviews methods for estimation and analysis of mortality and fertility rates from limited and faulty data, obtained from censuses, surveys, maternity histories, and vital registration systems. Topics include: estimation of infant, child, and adult mortality; age- and duration-specific fertility rates; determinants of birth intervals; and evaluation of family planning programs. Students participate in discussions of recent literature and statistical analyses of levels and trends in demographic rates.
Prereq. POP 205a,b or equivalent.

POP 209a,b. Foundations of Agricultural Sciences (Biology 195)
Lectures, seminars. *Two 1½-hour sessions each week. 5 units.* Dr. Levins.
Examines patterns of world food production as it develops from the interaction of social and biological systems: evolution of agro-ecosystems, principles of plant growth and productivity, pests and diseases, ecology of farming systems, consequences of technical choices, issues of agricultural change, and research strategies.
Prereq. Course in biology or permission of the instructor.

POP 210c,d. Population Biology
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Lewontin, Dr. Levins.
Approaches population studies from a general biological standpoint. Attempts to integrate population and community ecology, population genetics, and biogeography. Topics include: the structure of the environment in space and time and its interaction with organisms, simple single-species growth dynamics, age-dependent demography, two-species interactions, multiple-species community dynamics, evolution of the niche, elements of population genetics, and topics in biogeography.
Prereq. College courses in calculus and biology.

POP 212a,b. An Economic Approach to Population Policy
Not offered 1983-84.
Lectures. *One 2-hour session each week, with a third hour at the discretion of the instructor. 5 units.*
Presents the economics relevant to the formulation and evaluation of population policies in developing countries and surveys knowledge about the effectiveness of intervention strategies. Covers welfare economics of population policies; interactions between fertility and economic development; the impact on population growth of policies which affect incomes, education, survivorship, old-age security, and related variables, as well as conventional family planning programs.
Prereq. POP 200a,b and HPM 205a,b or equivalent.

POP 214c,d. The Biological Determinants of Fecundity, Environmental Factors, and Population Growth
Lectures. *One 2-hour session each week. 2.5 units.* Dr. Frisch.
Examines the direct effect of environmental factors such as nutrition and physical activity on female and male reproductive ability throughout the reproductive span. Topics include: adolescent growth, age of menarche, effects of exercise on the menstrual cycle, male maturation, age-specific fertility; pregnancy wastage, lactational amenorrhea and the birth interval, and age of menopause. Also included are the basic physiology and endocrinology of human reproduction, the history of birth control and the interaction of biological factors and social customs affecting population growth.

POP 216c,d. Comparative Analysis of Public Policies in Developing Countries (Government 2110)
Lectures, seminars, workshops. *One 2-hour session each week. 5 units.* Dr. John D. Montgomery (Professor of Public Administration, John F. Kennedy School of Government).
Examines patterns of policy making across cultures and issue areas, including interactions between policies and social contexts. Surveys Third World policies for dealing with such problems as population (fertility and migration); malnutrition; land reform; and management of large-scale irrigation systems. Applies the policy sciences approach to the formulation and implementation of large-scale programs of public intervention in social processes.

POP 217b. Introduction to Community Diagnosis of Birth and Death Rates in Developing Countries
Lectures, discussions. *One 2-hour session each week. 1.25 units.* Dr. Wyon.
Helps students distinguish within communities those kinds of persons at high risk of serious illness, death, and unwanted births. It uses data from studies at national and local levels to trace underlying causes of these events as the basis for designing feasible, effective, and simple preventive measures. Provides foundation for POP 202c,d and for other health and population courses considering policies and programs.
Prereq. Introductory courses in biostatistics, epidemiology, and (preferably) population sciences.

POP 220d. Human Ecology
Lectures, seminars. *Two 1-hour sessions each week. 1.25 units.* Dr. Levins.
Provides a broad overview of the human ecosystem as it emerges out of, but is different from, pre-human ecology. For each area of ecology, general principles will first be considered followed by examples from different human societies. Also considers the role of knowledge and conscious planning as an aspect of human ecology and examines approaches toward the solution of ecological problems.
Prereq. Assumes basic knowledge of biology.

HPM-POP 262c,d. Health Planning in Developing Countries
Lectures, seminars. *Two 2-hour sessions each week.* Laboratory. *One 1-hour session each week* (optional). *5 units.* Dr. Cash, Dr. Shepard.
(Course described under Health Policy and Management.)

POP-HPM 263c. Case Studies in Design and Management of Population and Community Health Programs
Case discussions, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Wyon, Members of the Department.
A managerial perspective on the problems of developing and implementing population and primary health care programs in Third World nations. Problems are examined from the level of managers of clinics, community and national programs. Topics covered primarily through case studies based on family planning and primary health care programs, particularly at the community and regional levels.

POP-HPM 264d. Case Studies in Comparative Design and Management of Population and Health Programs
Case discussions, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Wyon, Members of the Department.
Addresses the same problems as POP-HPM 263c with emphasis on the management of population, primary health care and social-economic development programs in a broad range of national contexts.
Students may take POP-HPM 263c and POP-HPM 264d separately or together.

POP 300. Tutorial Programs
Time and credit to be arranged.
Students at the master's level may make arrangements for tutorial work and special reading on topics related to population problems. There may be an opportunity to consider the design of studies, programs, or analysis of data.

POP 330e. Field Studies
During the week between the fall and spring terms and/or a week between the two halves of the spring term. Organized by Haitian graduates of this School. Students must sign up for the course with the Department by October 15, and be responsible for all or part of the travel costs. Please try to arrange funding before the start of the academic year. The estimated 1983-84 cost is $1,300 including air fare, accommodation, honorarium, and faculty time. Dr. Wyon.

Field Trip to Haiti
The objective of this field study is to provide exposure to the urban, rural, and development problems of a developing country. Students visit the homes of rural farmers to observe the living conditions of these families and their accessibility to health care facilities and programs. Students also see rural health centers, health surveillance teams, nutrition programs, and the headquarters of various health programs. What has been observed, how it relates to data previously collected, and what programs can be developed to improve the conditions are then discussed with the group's leaders and with local health planners. Students are required to give a talk to Haitian colleagues and to write a report. Enrollment limited to 10 and subject to approval of the instructors.

POP 350-355. Research
Time and credit to be arranged.
Candidates for doctoral degrees may undertake research in the Department or may integrate research in population sciences with a doctoral program in another department or at the Center for Population Studies.
Members of the Department and of the Center for Population Studies are currently engaged in research in the following areas:

350 *Field studies and programs*
Dr. Wyon, Dr. Guerrero, Dr. G. Berggren.

351 *Biomedicine and reproductive physiology*
Dr. Salhanick.

352 *Demography*
Dr. Potter.

353 *Population ethics*
Dr. Dyck.

355 *Complex systems*
Dr. Levins.

The following courses, offered by other faculties of Harvard University, are among those that may be of particular interest to students of population sciences. They are open to qualified students from the School of Public Health.

Ethics 2965. Seminar: Ethical Aspects of Population Policy
Half course (*spring term*). *Th., 10:30-12:30.* Dyck.
A critical analysis of past and contemporary questions concerning human rights with particular attention to questions of pro-creative rights and fertility-influencing policies. The reasoning underlying contemporary declarations on human rights will be examined.

Sociology 251. Seminar: Social Policy and Population Issues in the Developed Countries
Half course (*spring term*). *M., 2-4.* Alonso.
A broad range of issues in the developed countries, including education, health, housing, social security, status of women, labor policy, racial and group prejudice, are affected by declining fertility, growing up of the baby boom generation, and international migration. Stresses social processes involved and the policy responses proposed and tried out. (Offered in the Faculty of Arts and Sciences.)

TOX 204a. Introduction to Principles of Toxicology
Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Credit will be given only upon successful completion of this course *and* ESP 233c. Dr. Tashjian, Members of the Laboratory.
This course is a prerequisite for ESP 233c Environmental Toxicology and may not be taken in isolation. No credit will be offered until satisfactory completion of ESP 233c. The course content is identical to the first half of TOX 205a,b Principles of Toxicology.
Prereq. Organic chemistry and mammalian physiology.

TOX 205a,b. Principles of Toxicology
Lectures, seminars. *Two 2-hour sessions each week. 5 units.* Dr. Tashjian, Members of the Laboratory.
Emphasis placed on mechanisms of injury resulting from exposure to environmental chemicals at the molecular, cellular, organ and organismal levels. Methods used to detect, evaluate, analyze, and alleviate the toxic effects of chemicals are discussed.
Prereq. Organic chemistry and mammalian physiology.

TOX 208a,b/209c,d. Seminar in Toxicology
Seminars. *One 1-hour session each week. 1 unit each term.* Dr. Tashjian, Members of the Laboratory.
Seminars, journal clubs, and discussions of topics in basic research and the current literature in toxicology.
Prereq. Background in toxicology or related fields and permission of the instructor.

TOX 210a,b/211c,d. Advanced Toxicology
Not given 1983-84.
Lectures, discussions, seminars. *One 2-hour session each week.*
Laboratory. *To be arranged. 5 units.* Dr. Tashjian, Members of the Laboratory.
Examines experimental methods of research in toxicology. Includes individual laboratory work.
Prereq. TOX 205a,b or equivalent and permission of the instructor.

TPH 201a. Ecology, Epidemiology, and Control of Important Parasitic Diseases of Developing Areas
Lectures, seminars, demonstrations. *Two 1-hour sessions and one 2-hour session each week. 3 units.* Dr. Hoff, Members of the Department.
Provides an introduction to ecological and epidemiologic concepts basic to the control of infectious agents. Considers important parasitic and viral diseases of particular significance in the developing areas of the world. Epidemiologic principles of vector-associated diseases are elucidated through study of entities such as malaria and schistosomiasis. Prior knowledge of the pathogenesis of disease produced by infectious agents is desirable.

TPH 202b. Epidemiology of Infectious Diseases of Public Health Importance in Developing Countries
Lectures, team meetings. *Two 2-hour sessions each week. 2.5 units.* Dr. Cash, Dr. Weisfield, Guest Lecturers.
The epidemiology of infectious diseases of public health importance in developing countries will be thoroughly reviewed. Only those diseases caused by bacteria or virus will be discussed. Emphasis will be placed on the epidemiology patterns of these diseases as they relate to different geographic and socioeconomic environments. Methods of disease surveillance, especially as they relate to prevention and control, will also be stressed. Case studies will be used with student teams proposing solutions to the problems.
Enrollment limited to 60 and subject to approval of the instructors if no previous background in health care delivery.

TPH 203d. Perspectives in Tropical Health: The Background for Decision Analysis
Not given 1983-84.
Lectures, conferences. *One 2-hour session each week. 1 unit.* Guest Lecturers.
Provides background information on environmental, social, economic, and political factors that influence health programs in the tropics. At each session, a distinguished guest lecturer covers an assigned topic, including subjects such as the development of professional education; problems of agriculture, nutrition, and water supply; and the political background of international cooperation. Each presentation followed by informal student discussion.
Enrollment open to all students.

TPH 204c. Introduction to the Techniques of Investigation of Parasitic Infections
Lectures, laboratory, seminars. *Two 3-hour sessions each week. One 2-hour additional laboratory session each week, to be arranged. 5 units.* Dr. Pan.
Emphasizes laboratory methods for the study of parasitic diseases of public health importance. Provides exposure to theory and application techniques essential to epidemiologic and laboratory investigation. Life cycles of several parasites maintained and examined with respect to detection and quantification of infection, immunity, and control.
Enrollment limited to 15 and subject to approval of the instructors. Preference given to concentrators in tropical public health and cancer biology.

TPH 205c. Clinical and Pathologic Features of Tropical Diseases
Case presentations, clinico-pathologic conferences, demonstrations. *One 2-hour session each week. 1 unit.* Dr. Boyer, Dr. Dammin, Dr. Franz von Lichtenberg (Professor of Pathology, Harvard Medical School), Members of the Department, Members of the Pathology Department.
Designed for students particularly interested in tropical medicine. Emphasis is on the clinicopathologic aspects of tropical diseases. At each session, disease entities are introduced by presenting a clinical case, and pertinent clinical and pathologic features of the disease are then reviewed.
Enrollment subject to approval of the instructors.

TPH 206d. Principles of Public Health Entomology
Lectures, laboratories, seminars, field trips. *One 2-hour session and one 3-hour session each week. 3.5 units.* Dr. Spielman, Dr. Rossignol.
The manner in which arthropods transmit disease and the principles of vector control are discussed from ecological, physiological, and genetic points of view. Class sessions introduce concepts and techniques currently employed in controlling vector-borne disease. Weekend field trips provide an opportunity for students to apply skills acquired in the classroom.
Prereq. TPH 201a or suitable biology background, and permission of the instructors.

Dr. Dyann Wirth, Assistant Professor of Tropical Public Health.

TPH 208d. Current Problems in Schistosomiasis
Lectures and seminars. *One 2-hour session each week. 2 units.* Dr. Chernin, Members of the Department.
The problems posed by schistosomiasis as an expanding health hazard are presented in a series of lectures and seminars. Emphasis is given to the biology of snail vectors, to problems of assessment of significance of the disease, and to the potentials of various approaches to control.
Prereq. TPH 201a or permission of the instructors.

TPH 210c. Current Problems in Malariology
Lectures, seminars. *One 2-hour session each week. 2 units.* Dr. Hoff, Dr. Spielman, Members of the Department.
Reviews the biology of the malaria parasite, emphasizing factors that particularly affect transmission and human morbidity and mortality. Introduces the principles of malariometry and the strategies for controlling malaria. Analyzes current control programs in seminar discussions.
Prereq. TPH 201a and permission of the instructors.

TPH 216c,d. The Biology of Parasitism
Lectures, discussions. *One 3-hour session each week. 2.5 units.* Dr. David, Dr. Wirth, Members of the Department, Guest Lecturers.
Covers aspects of the biology, immunology, and molecular biology of various protozoa and helminths. Includes discussion on the mechanism of immune evasion, mechanism of antigenic variation, and the biology and immunology of malaria, schistosomes, filariae, leishmania, amoeba, and trypanosomes. Each session requires reading 3-4 papers in the literature and writing answers to problem sets.
Prereq. Suitable course in basic immunology and biology, and permission of the instructors.

TPH 300a,b,c,d,e. Tutorial Programs
Laboratory exercises. *Time and credit to be arranged.* Individual work for candidates at the master's degree level may be carried out under supervision of a member of the Department. Various parasites of medical importance are maintained and are available for studies on immunology, molecular biology, cell biology, biochemistry, and chemotherapy. Arrangements subject to approval of the instructor.

TPH 350. Research
Doctoral candidates or qualified full-time special students may undertake original investigations in the laboratory or in the field by arrangement with the Chairman of the Department.
Members of the Department are currently engaged in the following areas of research:

Biology, host-parasite relationships, and control of protozoa and helminths

Population genetics, nutrition, and reproduction of medically important arthropods

Immunology of protozoa and helminths

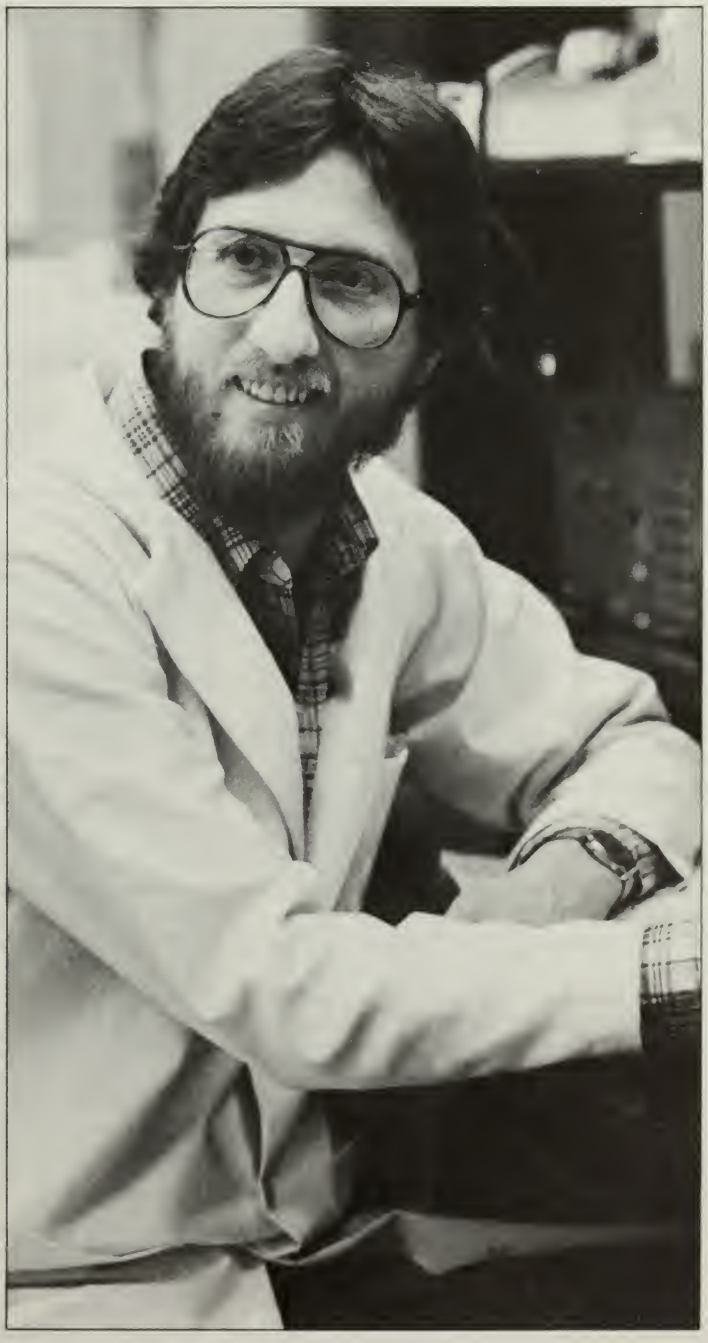
Molecular biology of protozoa and helminths

Arthropod transmission of viral, protozoan, and helminthic agents

Cultivation in vitro *of parasitic helminths and protozoa of medical importance*

Facing page, Dr. James Mullins, Assistant Professor of Virology.

OFFICERS OF INSTRUCTION AND RESEARCH



William Alonso, A.B., M.C.P (Harvard University); Ph.D. (University of Pennsylvania), Richard Saltonstall Professor of Population Policy (*Population Sciences*).

David Alan Amato, A.B. (Colgate University), S.M., Ph.D. (Cornell University); Assistant Professor of Biostatistics; *Dana Farber Cancer Institute.*

Mary Ochsenhirt Amdur, S.B. (University of Pittsburgh); Ph.D. (Cornell University), Associate Professor of Toxicology (*Environmental Science and Physiology*); *Lecturer, Massachusetts Institute of Technology.*

James Robert Anderson, A.B. (State University of New York at Buffalo); Ph.D. (University of Washington at Seattle), Assistant Professor of Biostatistics; *Dana Farber Cancer Institute.*

Harry Nicholas Antoniades, B.S., Ph.D. (Athens University, Greece), Professor of Biochemistry (*Nutrition*); *Senior Investigator, Blood Research Institute, Inc., Boston.*

James Edward Austin, A.A. (Flint Community Junior College); B.B.A. (University of Michigan); M.B.A., D.B.A. (Harvard University), Lecturer on Nutrition Policy and Programs (*Nutrition*); *Professor of Business Administration, Harvard Business School.*

Thomas Ferdinand Babor, A.B. (Manhattan College); A.M., Ph.D. (University of Arizona); M.P.H. (Harvard University), Assistant Professor of Psychology in the Faculty of Medicine and the Faculty of Public Health (*Behavioral Sciences*).

John Christian Bailar, III, A.B. (University of Colorado); M.D. (Yale University); Ph.D. (American University), Lecturer on Biostatistics; *Senior Scientific Advisor, Environmental Protection Agency.*

Edward Lamar Baker, Jr., A.B. (Vanderbilt University); M.D. (Baylor College of Medicine); M.P.H., S.M. in Phys. (Harvard University), Associate Professor of Occupational Medicine (*Environmental Science and Physiology*).

Robert Bruce Banzett, S.B. (Pennsylvania State University); Ph.D. (University of California at Davis), Assistant Professor of Physiology (*Environmental Science and Physiology*).

Kenneth Paul Barclay, A.B. (Tufts University); M.B.A. (University of Massachusetts, Amherst), Member of the Faculty of Public Health and Executive Officer of the School of Public Health.

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David Elliott Bell, A.B. (Pomona College); A.M., LL.D. (hon.) (Harvard University),Clarence James Gamble Professor of Population Sciences and International Health (*Population Sciences*) and Director of the Center for Population Studies.

Gretchen Mary Berggren, A.B. (Nebraska State College); M.D. (University of Nebraska); S.M. in Hyg. (Harvard University), Assistant Professor of Population Sciences.

Bengt Erik Bjarngard, M.Sc., D.Sc. (University of Lund, Sweden), Lecturer on Medical Radiation Physics (*Environmental Health Sciences*); *Professor of Radiation Therapy, Harvard Medical School.*

Elkan Rogers Blout, A.B. (Princeton University); Ph.D. (Columbia University), Member of the Faculty of Public Health and Dean for Academic Affairs; *Edward S. Harkness Professor of Biological Chemistry, Harvard Medical School.*

Leslie Irvin Boden, A.B. (Brandeis University); Ph.D. (Massachusetts Institute of Technology), Assistant Professor of Economics (*Environmental Science and Physiology* and *Health Policy and Management*).

Markley Holmes Boyer, A.B. (Princeton University); M.D. (University of Pennsylvania); D.Phil. (Magdalen College, Oxford University); M.P.H. (Harvard University), Associate Professor of Tropical Public Health.

Joseph David Brain, A.B. (Taylor University); S.M., S.M. in Hyg., S.D. in Hyg. (Harvard University), Professor of Physiology (*Environmental Science and Physiology*).

Laurence George Branch, A.B. (Marquette University); A.M., Ph.D. (Loyola University), Assistant Professor of Social Psychology *(Maternal and Child Health and Aging); Assistant Professor of Preventive and Social Medicine, Harvard Medical School.*

Peter Braun, S.B. (Yale University); M.D. (Columbia University), Lecturer on Public Health (*Health Policy and Management*).

J. Larry Brown, A.B. (Anderson College), A.M. (University of California, Los Angeles), M.S.W., Ph.D. (Brandeis University), Lecturer on Health Services (*Health Policy and Management*) and Director of the Community Health Improvement Program.

Jonathan Bernard Brown, S.B. (Portland State University); M.P.P., Ph.D. (Harvard University), Assistant Professor of Public Policy in Health Planning (*Health Policy and Management*).

William Alfred Burgess, S.B. (Tufts University); S.M. (Harvard University), Associate Professor of Occupational Health Engineering (*Environmental Science and Physiology*); *Corporate Manager of Industrial Hygiene, Polaroid Corp.*

James Preston Butler, A.B. (Pomona College); A.M., Ph.D. (Harvard University), Assistant Professor of Biomathematics (*Environmental Science and Physiology*).

John Cairns, M.D., B.A., B.M.,B.Ch., D.M. (Oxford University); A.M. (hon.) (Harvard University), Professor of Microbiology (*Cancer Biology*).

Richard Alan Cash, S.B. (University of Wisconsin); M.D. (New York University); M.P.H. (The Johns Hopkins University), Lecturer on Tropical Public Health; *Institute Fellow, Harvard Institute for International Development.*

Thomas Chalmers, A.B. (Yale University); M.D. (Columbia College of Physicians and Surgeons), Visiting Professor of Health Policy (*Health Policy and Management*); *Dean and Professor of Medicine, Mt. Sinai School of Medicine of the City University of New York.*

Eli Chernin, S.B. (College of City of New York); A.M. (University of Michigan); S.D. (The Johns Hopkins University), Professor of Tropical Public Health.

Allen Carrol Crocker, A.B. (Massachusetts Institute of Technology); M.D. (Harvard University); Lecturer on Maternal and Child Health (*Maternal and Child Health and Aging*); *Associate Professor of Pediatrics, Harvard Medical School.*

Allen Latham Cudworth, B.E.E. (University of Alabama); M.E.E. (Massachusetts Institute of Technology); S.D. in Hyg. (Harvard University), Lecturer on Applied Acoustics and Environmental Health (*Environmental Science and Physiology*); *Vice President of Liberty Mutual Insurance Company and Director, Hopkinton Research Center.*

William John Curran, J.D. (Boston College); LL.M., S.M. in Hyg. (Harvard University), Frances Glessner Lee Professor of Legal Medicine in the Faculty of Medicine and the Faculty of Public Health (*Health Policy and Management* and *Maternal and Child Health and Aging*).

John Rouben David, A.B. (College of the University of Chicago); M.D. (University of Chicago Medical School); A.M. (hon.) (Harvard University), John LaPorte Given Professor of Tropical Public Health; *Professor of Medicine, Harvard Medical School.*

Harold Wellington Demone, Jr., A.B., A.M. (Tufts University); Ph.D. (Brandeis University), Visiting Professor of Health Policy and Management; *Dean and Distinguished Professor, Rutgers University Graduate School of Social Work* (from January 1984.

Richard Dennis, S.B. (Northeastern University); S.M. (Harvard University), Associate Professor of Applied Environmental Health Engineering (*Environmental Science and Physiology*); *Director, Pollution Control Laboratory, G.C.A. Corporation, Bedford.*

Guy Blaudin de The, M.D. (University of Marseille Faculty of Medicine); Ph.D. (University of Paris - Sorbonne), Visiting Professor of Microbiology (*Cancer Biology*); *Professor, Université Claude Bernard, France.*

Eva Yona Deykin, A.B. (Radcliffe College); S.M. (Simmons College); M.P.H., Dr.P.H. (Harvard University), Assistant Professor of Social Work (*Maternal and Child Health and Aging*).

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Margaret Elizabeth Drolette, A.B. (Radcliffe College); M.P.H., Ph.D. (Harvard University), Professor of Biostatistics; Chief Coordinator of the Master of Public Health Program.

Johanna Todd Dwyer, S.B. (Cornell University); S.M. (University of Wisconsin); S.M. in Hyg., S.D. in Hyg. (Harvard University), Lecturer on Maternal and Child Health Nutrition (*Maternal and Child Health and Aging*); *Director, Stern Nutrition Center, Tufts Medical Center.*

Arthur James Dyck, A.B. (Tabor College); A.M. (University of Kansas); Ph.D. (Harvard University), Mary B. Saltonstall Professor of Population Ethics; *Member of the Faculty of the Harvard Divinity School* (on leave until January 1984).

Eric Eisenstadt, A.B., Ph.D. (Washington University), Assistant Professor of Biology (*Cancer Biology* and *Toxicology*).

Michael John Ellenbecker, B.E.E. (University of Minnesota); S.M. (University of Wisconsin); S.M. in Env.H., S.D. in Env.H. (Harvard University), Assistant Professor of Industrial Hygiene Engineering (*Environmental Science and Physiology*).

Robert Curtis Ellison, S.B. (Davidson College); M.D. (Medical University of South Carolina); S.M. in Epid. (Harvard University), Lecturer on Epidemiology; *Associate Professor of Pediatrics, Harvard Medical School.*

Myron Elmer Essex, S.B. (University of Rhode Island); D.V.M., S.M. (Michigan State University); Ph.D. (University of California), A.M. (hon.) (Harvard University), Professor of Microbiology (*Cancer Biology*).

Lawrence Adness Falk, Jr., A.B. (Centenary College); A.M. (University of Houston), Ph.D. (University of Arkansas), Associate Professor of Microbiology (*Cancer Biology*); *Associate Professor of Microbiology and Molecular Genetics, Harvard Medical School* (to December 31, 1983).

James Joseph Feeney, A.B. (Dartmouth College); M.D. (Harvard University), Member of the Faculty of Public Health; *Director of the Medical Area Health Service.*

Henry Arthur Feldman, A.B. (Swarthmore College); A.M., Ph.D. (Harvard University), Assistant Professor of Applied Mathematics (*Environmental Science and Physiology* and *Biostatistics*).

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Michael Lawrence Feldstein, B.A., M.Math. (University of Waterloo); Ph.D. (State University of New York at Buffalo), Assistant Professor of Biostatistics; *The Children's Hospital Medical Center.*

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Harvey Vernon Fineberg, A.B., M.D., M.P.P., Ph.D. (Harvard University), Professor of Health Policy and Management.

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Robert Pershing Geyer, S.B., S.M., Ph.D. (University of Wisconsin); A.M. (hon.) (Harvard University), Professor of Nutrition.

Peter Goldman, A.B. (Cornell University); A.M. (Harvard University); M.D. (The Johns Hopkins University); Professor of Health Sciences in Nutrition; *Maxwell Finland Professor of Clinical Pharmacology, Harvard Medical School.*

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Steven Lawrence Gortmaker, A.B. (University of Michigan); S.M., Ph.D. (University of Wisconsin), Assistant Professor of Sociology (*Behavioral Sciences*).

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Mark Irwin Greene, Ph.D., M.D. (University of Manitoba), Associate Professor of Immunology (*Cancer Biology*); *Associate Professor of Pathology, Harvard Medical School.*

Robert Arthur Greenes, A.B. (University of Michigan), M.D., Ph.D. (Harvard University), Member of the Faculty of Public Health (*Biostatistics*); *Associate Professor of Radiology, Harvard Medical School.*

Nancy Mueller Gutensohn, A.B. (Beloit College); S.M. in Epid., S.D. in Epid. (Harvard University), Assistant Professor of Epidemiology.

Tamara K. Hareven, A.B., (Hebrew University); A.M. (Cincinatti University); Ph.D. (Ohio State University), Lecturer on Population Studies (*Population Sciences*); *Professor, Clark University.*

David Paul Harrington, A.B. (Tufts University), A.M., Ph.D. (University of Maryland), Visiting Associate Professor of Biostatistics; *Associate Professor of Mathematics, University of Virginia.*

Joseph John Harrington, B.C.E. (Manhattan College); A.M., Ph.D. (Harvard University), Professor of Environmental Health Engineering (*Environmental Science and Physiology* and *Population Sciences*) in the Faculty of Public Health and Gordon McKay Professor of Environmental Engineering in the Faculty of Arts and Sciences.

William Alan Haseltine, A.B. (University of California at Berkeley); Ph.D. (Harvard University), Associate Professor of Microbiology (*Cancer Biology*); *Associate Professor of Pathology, Harvard Medical School.*

Kenneth Cronise Hayes, A.B. (Wesleyan University); D.V.M. (Cornell University); Ph.D. (University of Connecticut), Associate Professor of Nutrition.

Maxine Delores Hayes, A.B. (Spelman College); M.D. (State University of New York at Buffalo); M.P.H. (Harvard University), Lecturer on Maternal and Child Health (*Maternal and Child Health and Aging*); *Executive Director/Medical Director, Hinds-Rankin Urban Health Innovations Project.*

John Hedley-Whyte, B.A., M.B., B.Chir., M.A., M.D. (Cambridge University, England), Member of the Faculty of Public Health (*Health Policy and Management*); *David S. Sheridan Professor of Anaesthesia and Respiratory Therapy, Harvard Medical School.*

David Hemenway, A.B. (Harvard University); A.M. (University of Michigan); Ph.D. (Harvard University), Assistant Professor of Political Economy (*Health Policy and Management*).

Albert Edwin Henn, S.M. (Michigan State University); M.D. (Wayne State University); M.P.H. (Harvard University), Lecturer on Health Policy and Management; *Joint Coordinator for International Projects, Harvard Institute for International Development.*

Manuel Guillermo Herrera-Acena, A.B., M.D. (Harvard University), Associate Professor of Medicine (*Nutrition*).

Regina Elbinger Herzlinger, S.B. (Massachusetts Institute of Technology); D.B.A. (Harvard University), Member of the Faculty of Public Health (*Health Policy and Management*); *Professor of Business Administration, Harvard Business School.*

Howard Haym Hiatt, M.D. (Harvard University), Dean of the Faculty of Public Health; *Professor of Medicine, Harvard Medical School.*

Rodney Hoff, S.B. (University of Wisconsin); M.P.H. (University of North Carolina); S.M., S.D. in Tr.P.H. (Harvard University), Assistant Professor of Tropical Public Health.

Donald Frederick Hornig, S.B., Ph.D. (Harvard University), Alfred North Whitehead Professor of Chemistry in Public Health (*Environmental Science and Physiology*); Director of Interdisciplinary Programs in Health.

William Ching-Lung Hsiao, A.B. (Ohio Wesleyan University); M.P.A., Ph.D. (Harvard University), Associate Professor of Economics (*Health Policy and Management*); *Member of the Faculty of Harvard Business School.*

George Barkley Hutchison, A.B., M.D., M.P.H. (Harvard University), Professor of Epidemiology.

Roland Harrison Ingram, Jr., S.B. (University of Alabama); M.D. (Yale University), Member of the Faculty of Public Health (*Environmental Science and Physiology*); *Parker V. Francis Professor of Medicine, Harvard Medical School.*

Philip F. Judy, S.B., S.M., Ph.D. (University of Wisconsin), Lecturer on Medical Radiation Physics (*Environmental Science and Physiology*); *Assistant Professor of Radiology, Harvard Medical School.*

Michele Jungery, S.B. (University of Colorado); M.P.H., Ph.D. (University of California, Berkeley), Assistant Professor of Tropical Public Health.

Nancy Morgan Kane, S.B. (Simmons College); M.B.A., D.B.A. (Harvard University), Assistant Professor of Management (*Health Policy and Management*).

Jack Kasten, S.B. (Michigan State University); M.P.H. (University of Michigan); J.D. (Boston College), Lecturer on Health Services Administration (*Health Policy and Management); Vice President, Arthur D. Little, Inc., Cambridge.*

Ann Randtke Kennedy, A.B. (Vassar College); S.M. in Env. H., S.D. in Phys. (Harvard University), Associate Professor of Radiobiology (*Cancer Biology*).

Ralph Leo Kent, Jr., A.B. (University of Notre Dame); S.M. in Bios., S.D. in Bios. (Harvard University), Lecturer on Biostatistics; *Assistant Staff Member, Forsyth Dental Center.*

William Monroe Keyserling, B.I.E. (Georgia Institute of Technology). S.M.E., S.M., Ph.D. (University of Michigan); Assistant Professor of Occupational Safety (*Environmental Science and Physiology*).

Richard Clark Killin, A.B. (University of Arizona); LL.B. (University of Michigan), Member of the Faculty of Public Health and Special Assistant to the Dean.

Gerald Lawrence Klerman, A.B. (Cornell University); M.D. (New York University); A.M. (hon.) (Harvard University), Lecturer on Epidemiology; *Professor of Psychiatry, Harvard Medical School.*

Stephen William Lagakos, S.B. (Carnegie-Mellon University); M.Phil., Ph.D. (George Washington University), Associate Professor of Biostatistics; *Dana Farber Cancer Institute.*

Nan Laird, S.B. (University of Georgia); Ph.D. (Harvard University), Associate Professor of Biostatistics.

Robert Lansing, A.B. (Seattle Pacific College); A.M., Ph.D. (University of California at Los Angeles), Visiting Professor of Physiology (*Environmental Science and Physiology*); *Professor of Psychology, University of Arizona.*

Martin Graham Larson, A.B., S.M., S.D. in Bios. (Harvard University), Assistant Professor of Biostatistics and Population Sciences; *Co-Director Biometry Unit, Robert B. Brigham Multipurpose Arthritis Center.*

Philip Todd Lavin, A.B. (University of Rochester); Ph.D. (Brown University), Associate Professor of Biostatistics; *Dana Farber Cancer Institute.*

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David Evan Leith, A.B. (Lehigh University); M.D. (Harvard University), Member of the Faculty of Public Health (*Environmental Science and Physiology*); *Associate Professor of Anaesthesia, Harvard Medical School.*

David Hugh Leith, S.B., S.M. in Ch.E. (University of Cincinnati); S.D. in Env. H. (Harvard University), Associate Professor of Environmental Health Engineering (*Environmental Science and Physiology*).

C. Robin LeSueur, B.A., B.S.W. (University of Toronto); M.L.S. (Columbia University), Member of the Faculty of Public Health and the Faculty of Medicine; *Librarian in the Francis A. Countway Library of Medicine.*

Richard Levins, A.B. (Cornell University); Ph.D. (Columbia University), John Rock Professor of Population Sciences.

Howard Jules Levy, S.B., S.M., M.B.A. (Rensselaer Polytechnic Institute), Member of the Faculty of Public Health and Associate Dean for Finance and Operations.

Richard Charles Lewontin, A.B. (Harvard University); A.M., Ph.D. (Columbia University), Member of the Faculty of Public Health (*Population Sciences*); *Alexander Agassiz Professor of Zoology, Harvard University.*

John Bertram Little, A.B. (Harvard University); M.D. (Boston University), Professor of Radiobiology (*Cancer Biology*) and Director of the Kresge Center for Environmental Health.

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Thomas Arthur Louis, A.B. (Dartmouth College); Ph.D. (Columbia University), Associate Professor of Biostatistics.

Bernard Lown, S.B. (University of Maine); M.D. (The Johns Hopkins University), Professor of Cardiology in Nutrition.

Mohamed Sayed el Lozy, M.B.,B.Ch. (University of Cairo); M.D., Ph.D. (University of Alexandria), Associate Professor of Nutrition.

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